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TAYLORCRAFT** p.125

**BUILD AN ELECTRIC
GERMAN FIGHTER!** p.89

**FIXING ENGINE
AIR LEAKS** p.140

JUNE 2005

MODEL Airplane NEWS

**MAXIMUM
CONTROL!**
31 HIGH-TECH
RECEIVERS

**WOW THE
CROWD** > ROLLING
CIRCLE SECRETS

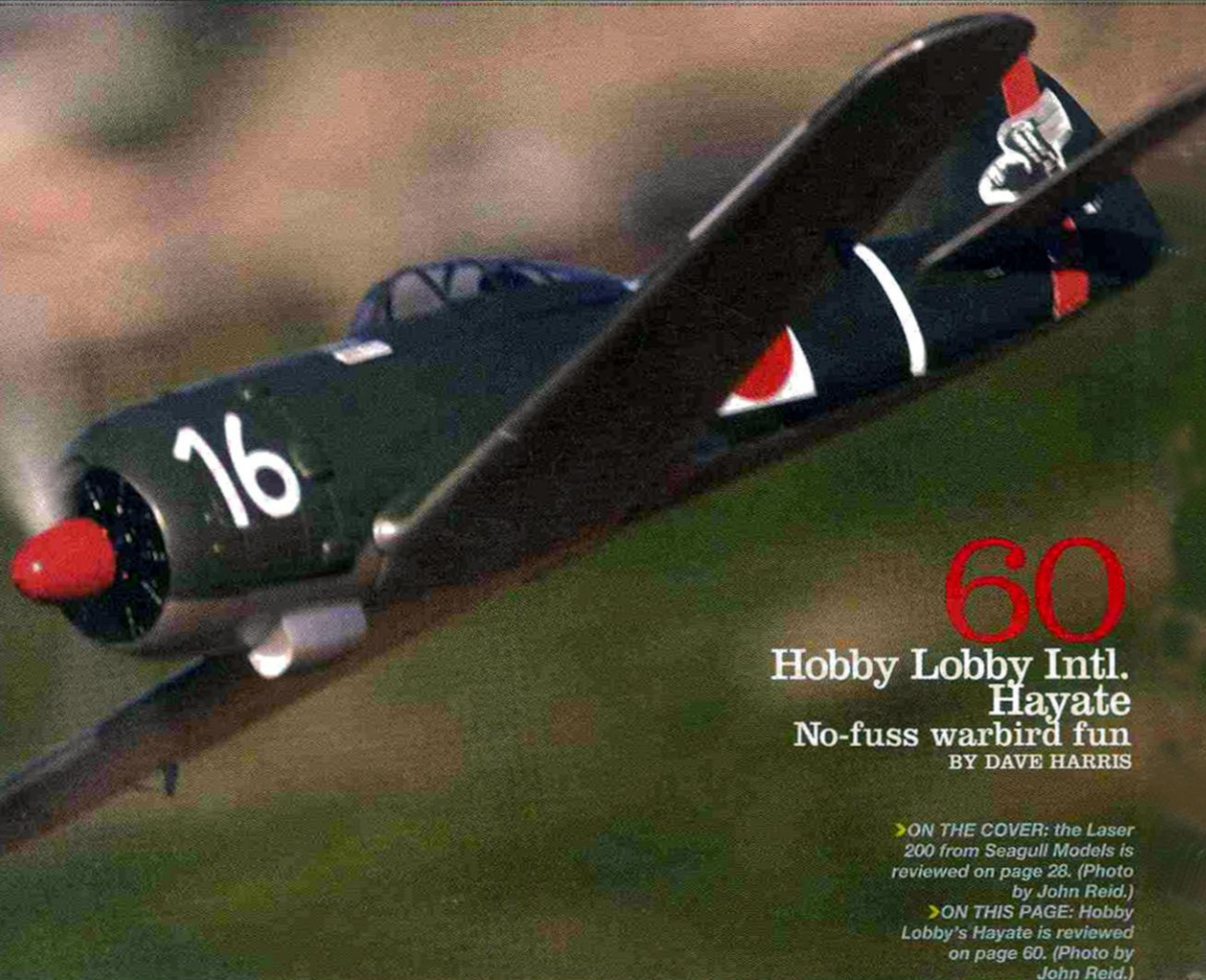
Seagull Models
Laser 200

**TESTED
GIANT
POWER!**
FUJI'S FIRST
GAS 4-STROKE

+5 FLIGHT TESTS

- >> Hobby Lobby **Hayate**
- >> Great Planes **Super Sportster EP**
- >> Sportsman Aviation **Excelleron 90**
- >> SR Batteries **Eindecker** >> Seagull Models **Laser 200**





60 Hobby Lobby Intl. Hayate No-fuss warbird fun BY DAVE HARRIS

► **ON THE COVER:** the Laser 200 from Seagull Models is reviewed on page 28. (Photo by John Reid.)

► **ON THIS PAGE:** Hobby Lobby's Hayate is reviewed on page 60. (Photo by John Reid.)

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RECEIVERS, FLYING TIPS— AND MORE!

THERE'S NOTHING A MAGAZINE EDITOR ENJOYS MORE THAN HEARING from readers who say that they bookmark and save our issues for future reference. With the dedication of our topnotch contributors and in-house editors, we aim to fill every issue of *Model Airplane News* with those "save-it" features. This month, our "Maximum Control" high-end receiver guide certainly qualifies as a keeper. If you have more than one plane in your hangar (and who doesn't?), you know that having extra receivers is a great investment. This month, we take an in-depth look at 31, 6- to 12-channel signal-catchers and explain the basics of how these high-tech receivers work and the features they offer. This one is a must-read before you buy a receiver!

No matter which size or type of plane we fly—or how nimble our thumbs!—we all want to improve our flying, and who better to learn from than a national champion? This month, Dave Patrick shares his secrets to performing another showstopper in "The ABCs of the Rolling Circle." This impressive maneuver takes time to perfect, but the result will be worth the effort (just picture all those dropped jaws at the field!).

Since it was announced, the Fuji BF34EI has caused quite a stir among the giant-scale crowd. Will this gas-powered 4-stroke live up to expectations? "Thinking Big" columnist and *Model Airplane News* senior tech expert Gerry Yarrish could hardly wait to bench-test the first available engine from Fuji; see the results and his full review on page 116.

Got engine questions? Good; we have answers! In his "Real Performance Measurement" column this month, engine expert Dave Gierke offers advice on engine mounts, tuning and more. These real-life engine mysteries come from our readers, so if you have an engine question, please email or write to Dave care of the magazine at man@airage.com, or 100 East Ridge, Ridgefield, CT 06488-4606 USA.

If you're looking for a scratch-building project, we offer two great original designs in this issue. With a 42-inch wingspan, Mark Rittinger's Messerschmitt Bf 109E features traditional construction and is powered by an inexpensive brushed motor geared 3.5:1. Like Mark's previous designs in *Model Airplane News*, this warbird is a fine flyer that's guaranteed to turn heads at the field.

You're in for a treat if you're partial to smaller models: go to the *Model Airplane News* website for a free downloadable plan of Dave Robelen's 1-ounce Micro Clipped-Wing Taylorcraft! This 15-inch-span, all-balsa model offers plenty of performance and uses magnetic actuators for control. If you've been intrigued by microflight, this is a great time to get started. Be sure to see Dave's article on page 125.

Safe landings.



Debra Cleghorn
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Jon Chappell

EDITORIAL

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I HAVE BEEN a fan of the Rare Bear race team for many years ... since the mid-'70s ...

BETTER THAN YOUR AVERAGE BEAR!

The cover of your December 2004 issue that features the Thunder Tiger Rare Bear racer was great! I have been a fan of the Rare Bear race team for many years and have followed the racing career of the Bear's chief pilot Lyle Shelton, since the mid-'70s. I have built several models of the Rare Bear; I modified the old Top Flite and Royal Grumman Bearcat kits to produce the Reno racer. I can't wait to get the new one from Thunder Tiger! Thanks for a great first look!

RICKY JOHNSON [EMAIL]

Ricky, our West Coast associate editor John Reid is also a fan of the Bear, and he jumped at the chance to review the one sent to Model Airplane News. This model requires a fair amount of assembly work, but the result is well worth the effort. Having tweaked the

balance and control throws, John is now doing a pretty good impersonation of Lyle Shelton! Have fun with your new Rare Bear.

GY

FUN-FLY FANATIC

Many of the models available today are referred to as "fun-fly." I think all models are fun to fly, but is there a class of competition out there, such as pattern or scale, that's actually called "fun-fly"? If so, where can I get more information on it? The fun-fly airplanes I read about seem to be very high performance. I'd like to find models that are a bit easier to control.

RALPH THOMPSON [EMAIL]

Ralph, yes; there is a fun-fly aerobatics class, and it is very popular, indeed! The difference between fun-fly and typical aerobatic competi-

FREE! FULL-SIZE PULLOUT PLAN >>> AT-6 TEXAN p. 224

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JUST 1,000! Thunder Tiger Rare Bear

Budget Computer Control HITEC'S NEW OPTIC 6

FLY BETTER! 12 SIMPLE SETUP TIPS

Top World Beaters, Spitfire 3 Giant scale warbird
Aerobics: Hitecwin Speedster 3 Quick-build aircraft
New! Zero 1 40-size Biting Sun Rigger
New! 124 Fokker Triplane 3 All wood kit

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tions is that the pilots are judged against time; other aerobatic events are judged according to how well a pilot flies each maneuver. Contrary to what you may think, you don't need a super-high-performance model to get started in fun-fly. What you do need, though, is a rugged, 4-channel model that can do loops, rolls, spins and touch-and-go's. These are the basic

The Cocktail Series



ScrewDriver Electric ARF

Specifications:
Wing Span: 40.7 inches
Wing Area: 325.7 sq. in.
Flying Weight: 21.1 ounces
Radio Required: 4 channel, 4 motor servo
ESC Required: 12 Amp (KAV4481)
Battery Required: 8 Cell, 600mAh NiCad Pack
Includes "Plug & Fly" 400-size motor, gearbox, APC prop, and hardware. Order from KAV4524



BloodyMary Electric ARF

Specifications:
Wing Span: 38.4 inches
Wing Area: 325.5 sq. in.
Flying Weight: 14 ounces
Radio Required: 5 channel, 2 motor servo
ESC Required: 5 Amp (KAV4481)
Battery Required: 8 Cell, 600mAh NiCad Pack or 8 Cell, 600mAh NiMH Pack
Includes "Plug & Fly" 400-size motor, gearbox, prop, and hardware. Order from KAV4423



BloodyMary Thermal Electric ARF

Specifications:
Wing Span: 34.7 inches
Wing Area: 401 sq. in.
Flying Weight: 15.9 ounces
Radio Required: 5 channel, 2 motor servo
ESC Required: 4 Amp (KAV4481)
Battery Required: 8 Cell, 600mAh NiCad Pack
Includes "Plug & Fly" 280-size motor, gearbox, prop, and hardware. Order from KAV4523

The KAVAN Cocktail Series is perfect for those after-hours times of relaxation. The BloodyMary ARF is a great first time flyer, while its sister airplane, the BloodyMary Thermal ARF catches thermals like a glider, flies at a walking pace, and may be the finest first-time airplane for no or little wind conditions. Want something with more kick? Try the ScrewDriver ARF. Using a "Plug & Fly" 400-size electric motor and full 4-channel control, it's the perfect step-up model for the seasoned flyer. All of the KAVAN Cocktail Series airplanes are hand built from the finest woods, then expertly covered in genuine Oracover® covering material. See them all at leading hobby retailers.

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Tygon and replace it each season, and you shouldn't have any problems! GY

DUCTED-FAN FANATIC

Hats off to Rich Uravitch for another great design! I just ordered the plans and parts for the MiniWave (April 2005 issue) from him, and I can't wait to get started. Ducted fans and electric motors are a match made in heaven: I've built several nitro-powered ducted-fan models in the past and wished they weren't so complicated to adjust and expensive to maintain, but when I tried an electric version, I was hooked! The reliability of high-power brushless motors is another plus.

Rich Uravitch has always had a knack for designing great-looking, easy-to-build, great-flying models; please thank him on behalf of all of us scratch-builders.

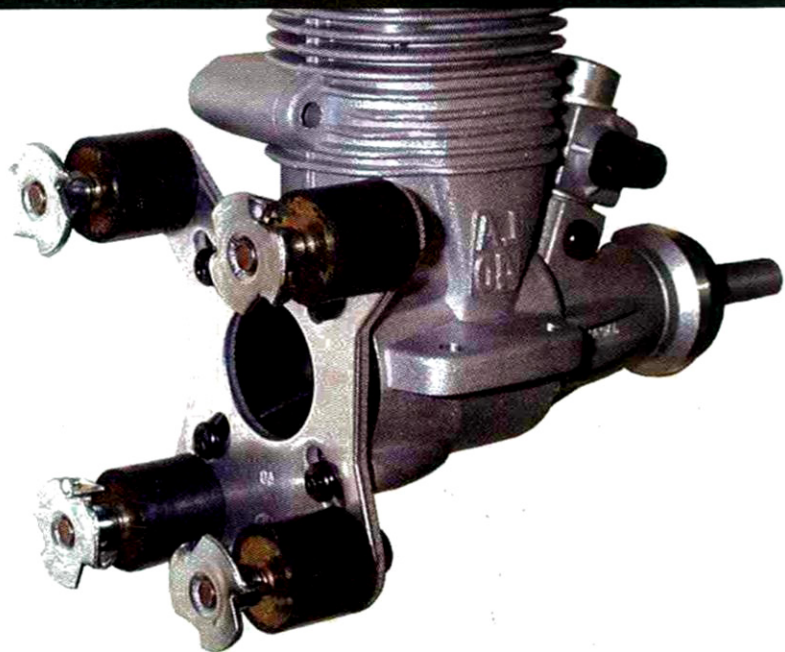
STUART WESTFIELD [EMAIL]

We agree wholeheartedly, Stuart, and thank you for passing along the feedback. You'll be happy to know that Rich has several other designs in the works for us, including a twin-electric ducted fan. I wish I could tell you which model he's working on now, but I'm under strict orders not to divulge Rich's top-secret plan. Stay tuned to Model Airplane News for more info soon! GY

COVERING FOAM

Talk about timing! After my son's Formosa made a "nonscheduled vertical landing," I bought another one and decided to enhance it for even better performance. I had already sanded out the injection-molding bumps in the foam pieces and was contemplating how best to finish out the airframe when lo and behold, I got the new issue of *Model Airplane News* with Rick Bell's "How To: 15 Steps to Cover Foam" (with—what else?—a Formosa as its subject)! As I didn't have any HobbyLite filler on hand, I went with the old tried-and-true lightweight spackle from

Smoothie.



The Simple Flex-Mount.

When it comes to reducing noise and vibration, it doesn't get any simpler than this.

Flex Mounts are easy to install -- no drilling or tapping. They are light weight (the .50 to .80 size weighs only 39 grams/1.38 oz complete). They help protect your airframe and electronics by absorbing harmful vibration. And they help reduce noise.

The kit includes a 6061-T6 Aluminum Backplate, Rubber Isolators and hardware. They are available in .35-.50 (\$275), .50-.80 (\$278) and .80-1.20 (\$281) engine sizes, and replacement parts are available.

So be smooth. Use a Flex-Mount.

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www.sullivanproducts.com

Sullivan

Ace Hardware. (At about \$1.20 per quart, it's much cheaper than HobbyLite.) I filled in the major dents with straight filler and then followed Rick's suggestion and used a brush to apply the slurry to the micro depressions; I had the best luck with an old shaving brush. The EconoKote goes on tonight!

Beautiful Formosa, Rick. Thanks for the timely article!

MARSHALL MCKINNEY
SILVERTHORNE, CO

We're glad our timing worked to your advantage, Marshall! Rick's Formosa certainly attracted a lot of attention here in the office, and we think you'll be seeing a lot more of these film-covered foamies in the future! DC ✦

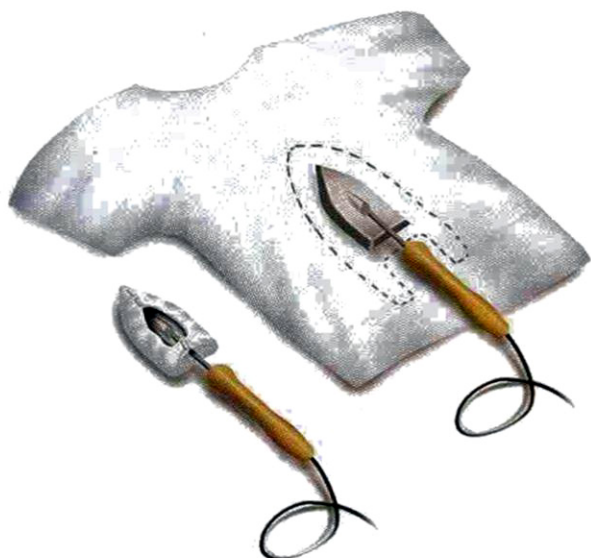
WRITE TO US! WE WELCOME YOUR COMMENTS AND SUGGESTIONS. LETTERS SHOULD BE ADDRESSED TO "AIRWAVES," MODEL AIRPLANE NEWS, 100 EAST RIDGE, RIDGEFIELD, CT 06877-4606 USA; EMAIL MAN@AIRAGE.COM. LETTERS MAY BE EDITED FOR CLARITY AND BREVITY. WE REGRET THAT, OWING TO THE TREMENDOUS NUMBERS OF LETTERS WE RECEIVE, WE CANNOT RESPOND TO EVERY ONE.

Budget Covering-Iron Socks

Even the cleanest covering iron can put very fine scratches in the covering material that you've painstakingly applied to your favorite aircraft, and as your iron gets older and its surface wears, those scratches become more noticeable. Commercially available covering-iron socks are an effective solution, but they come at a price. A zero-cost solution is to just make your own out of an old T-shirt.

Place your covering iron on an old T-shirt, and trace around it with a felt-tip pen. Cut out the pattern, fold the edges around the tip of the iron, and secure with one or two staples. When the tip of the cover is secure, tie the tails of the cover over the handle for a snug fit. When the cover gets old, use the same T-shirt to make a new one; you can usually make several covers out of one shirt.

John Stewart, Jamul, CA



Easy Pitts Muffler Extensions

The exhaust stacks on most Pitts-style mufflers are often too short to exit the bottom of your cowl. Although you could purchase muffler extensions, a less expensive alternative is to make your own extensions out of silicone heat-shrink tubing. You can get high-quality 3M silicone tubing at most electronic-supply stores. The tubing shrinks to about 50 percent of its original size and will withstand the heat from your muffler. Choose tubing that shrinks to about the same diameter as the exhaust stacks on your muffler. To ensure that the tubing doesn't slip off, secure the tubing and exhaust stack with a zip-tie.

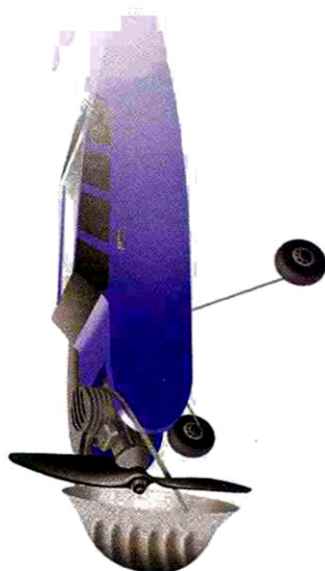
Greg Ray, Montrose, CO



Nose Job

Many modelers store their pride-and-joy airplanes by hanging them vertically on a wall. After a plane has hung this way for a while, oil and fuel residue will drip onto the floor—not good, especially on a carpeted surface. Here's a solution: just hang a surgical mask over the engine and under the prop to catch the oil and fuel that may drip out. You can buy these masks at any hardware store or home-improvement center. A single mask will last an entire flying season.

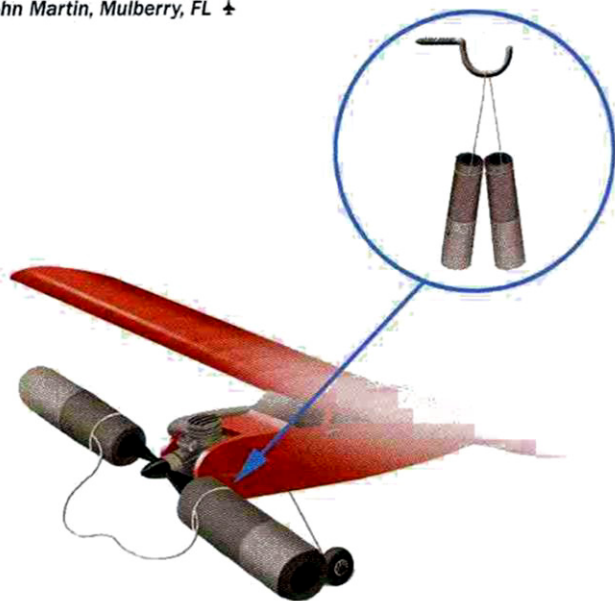
Gary Stevens, Russell, KY



Prop-er Protection

Many propellers have sharp tips that can easily puncture the covering on a wing or a fuselage; even worse, the tips could scratch an unsuspecting passerby's arm or leg. Foam pipe insulation makes great prop protectors. It's cheap and comes in many diameters and lengths. Cut two pieces to completely cover the blades of your prop, poke two holes through the ends of the covers, and run a cord through them to keep them together when they aren't in use.

John Martin, Mulberry, FL ✈



SEND IN YOUR IDEAS. Model Airplane News will give a free, one-year subscription (or a one-year renewal, if you already subscribe) for each idea used in "Tips & Tricks." Send a rough sketch to Model Airplane News, 100 East Ridge, Ridgefield, CT 06877-4606 USA. BE SURE THAT YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH ITEM YOU SUBMIT. Because of the number of ideas we receive, we can neither acknowledge each one nor return unused material.



Iron Bay Hellcat F6F-3

Brandt Jasper
Rosemount, MN

Built for Brandt by Steve Hartwell, this 1/6-scale beauty weighs 35 pounds, has an 87-inch wingspan and is 70 inches long. A Fox 4.2 engine and a Byron 3-blade prop power the Hellcat. Brandt also installed Robart 150 retracts that handle the model admirably on the ground. According to Brandt, the Hellcat's flight performance is "... fantastic and very scale."

F-14 Tomcat

Bill DeRego
Kailua, HI

Aloha! This pilot's project comes to us all the way from Hawaii. Bill converted the F-14 that he built from a DCU Mfg. kit to handle two Artes Jet USA turbine engines that put out 14 pounds of thrust each. This twin-turbine fighter weighs 25 pounds dry and 36 pounds when filled with 144 ounces of Jet A fuel for takeoff. It has an extended wingspan of 78 inches and sports a DCU landing-gear and brake system. Bill chose to model his jet in the colors of the VFI squadron—the first squadron of F-14s to operate from an aircraft carrier—specifically, the Enterprise.



HVP Modell Bristol

Beaufighter

Warner Lowe
Lake Oswego, OR

According to Warner, this 1/12-scale Beaufighter "... flies as good as it looks!" He powers this attractive model with two Axi 2808/16 motors and a 9-cell, 3300mAh NiMH battery pack. Modeled after the Bristol Beaufighters that flew during WW II, this model looks just like the full-size fighter—except, of course, for the 55-inch wingspan!

Dynaflite Super Decathlon

Bradley Buchanan
Layton, UT

Powered by an inverted O.S. 1.60 FX 2-stroke engine, a 16x6-10 prop, a J-Tec muffler, a 3-inch chrome spinner, 6 Hitec servos and a JR 8-channel radio, this Super Decathlon "... is a great-flying airplane and is very easy to land," according to Bradley. He also installed a TME pump, which creates beautiful smoke contrails while the plane performs various aerobatic feats. Its orange and white Coverite finish with black pinstriping and LustreKote paint gives this giant-scale bird a handsome look. With its wingspan of 89 inches, you would never guess that this model weighs only 14 pounds.





◀ Grumman Wildcat Bud Chappell Portland, CT

Powered by a geared AstroFlight Cobalt 25 motor and a Master Airscrew 13x6 3-blade prop, this Wildcat really tears up the sky. Built to duplicate the Wildcat flown in 1942 by Lt. Edward "Butch" O'Hare, Bud's model has a 56-inch wingspan, is 44 inches long, has a wing area of 574 square inches and weighs only 6½ pounds. Amazingly, Bud built his model from the landing gear up! He inventively constructed the Wildcat's landing gear using copper tubes and music wire, and it's actuated by one standard 180-degree retract servo. Very creative!

▶ Delta Vortex

Joe McCary
Fredericksburg, VA

According to Joe, this 7-pound Delta Vortex can "... last all afternoon on one tank of fuel." He powers his Delta with an O.S. .70 Ultimate engine and a pump that he has mounted on its side to take fuel from its 17-ounce tank. Joe explains that his model is fully aerobatic and "goes where you tell it to." It is also the most stable flying platform that he has ever built and flown over the past 50 years!



◀ Grumman J2F-6 "Duck"

Robert Pease
Astor, FL

This 1/4-scale, scratch-built Grumman was assembled using Cleveland Plans that were enlarged by 10 percent. It has a 65-inch wingspan and 1,322 square inches of wing area, and it weighs 18 pounds. The Duck soars when powered by a GMS 1.20 engine, a Hitec radio, a Futaba receiver and 9 Futaba servos. Its construction was actually started by Robert's friend Fred Strauss in 2002, but Robert recently completed it, and he included features such as retracts, rivets, a fully detailed cockpit and a sliding canopy.

▶ Air Tractor 802F SEAT

Gregg Putman
Gillette, WY

Gregg refers to this project as a "kit bash," since he took a Sig Four Star 120 and converted it into a semi-scale Air Tractor 802F single-engine air tanker (SEAT), known as "Slurry Bomber." Having grown up in the mountains of Wyoming, where forest fires were always a threat, Gregg decided to design and dedicate a plane to represent the firefighting AT802F slurry bombers that he used to see overhead. He powers his model with a Saito 1.50 Golden Knight 4-stroke engine installed inverted with a Slimline muffler. A Graupner 15x8, 3-blade prop, 9 JR digital servos and receiver and a JR 8103 radio round out the airborne package. This 15-pound 11-ounce Air Tractor with its 83½-inch wingspan sports RAM navigation lights and functional bay doors that can hold more than two cups of baby powder for its simulated slurry. ✦



SEND IN YOUR SNAPSHOTS. Model Airplane News is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable, but please do not send digital printouts or Polaroid prints. Emailed submissions must be at least 300dpi. We receive so many photographs that we are unable to return them. All photos used in this section will be eligible for a grand prize of \$500, to be awarded at the end of the year. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in! Send those pictures to "Pilot Projects," Model Airplane News, 100 East Ridge, Ridgefield, CT 06877-4606 USA.

click trip
MODELAIRPLANENEWS.COM

FOR VIDEO
OF GREGG'S
SLURRY BOMBER

WATTAGE PITTS 400

Are two wings really better? One look at the classic Pitts design, and you know it's true! This updated semi-scale design from WattAge is ideally suited to a brushless motor and Li-poly batteries. With four ailerons, it has great roll authority and offers brisk flight performance. It features one-piece, wooden built-up wings, a scale, molded-plastic fuselage and aluminum landing gear and quick, easy assembly so you can take to the skies right away. Specs: wingspan—28.75 in. (upper), 27.25 in. (lower); wing area—280 sq. in.; weight—25 to 28 oz.; wing loading—12.75 to 15 oz./sq. ft.; length—25.5 in.; radio req'd—4-channel w/3 microserves.

WattAge; distributed by Global Hobby Distributors (714) 963-0329; watt-age.globalhobby.com.



ELECTRIFLY FLATOUT SERIES

Think all profile 3D "foamies" are the same? Wait until you see the new FlatOut series of planes from ElectriFly! The first two releases in this line of \$50 flyers are the Flatana and CAP 580, but look for a Turmoil, Reflection and Patty Wagstaff Extra 300S coming soon. The Flatana and CAP 580 each have 36-inch wingspans, are about 30 inches long and weigh 7.5 to 9 ounces. Each plane comes with a motor and features extra-stiff, 3mm-thick, preprinted foam construction that's reinforced with carbon-fiber rods and hardware developed specifically for foam aircraft. You'll just need a 4-channel radio with 3 microserves, a 10A ESC and 3S 350mAh Li-poly battery pack. If you're looking for even more all-out performance, upgrade to the Great Planes Rimfire brushless outrunner motor for just \$70! **ElectriFly;** distributed by Great Planes Model Distributors (217) 398-6300; (800) 682-8948; electrifly.com.



FUTABA 14MZ

With a nearly infinite variety of servo programming options, incredibly precise, realistic response, touch-screen programming, voice prompts and more, the Futaba 14MZ promises to be the ultimate in radio control. It incorporates a Microsoft Windows CE processor to take care of "nonflight" details such as input, communications and features pertaining to the Compact Flash card, so the Futaba custom processor can focus solely on flying functions. Not only can it transmit in PCM, FM and PPM modes, but it also comes with a R5014DPS receiver that it can program to operate on any frequency! Additional features include an easy-to-understand graphic display, 100-model memory, nine flight conditions, 32 selectable functions and a 220mAh lithium-ion battery that can power the radio for nearly 3 hours. Cost of the Futaba 14MZ: \$3,300. Having the coolest radio at the flying field: priceless.

Futaba; distributed by Great Planes Model Distributors (217) 398-6300; (800) 682-8948; futaba-rc.com.



➤ HOBIBICO TWINSTAR ARF

This .25 to .40-size twin is designed for fast assembly and maximum flying security and stability. Each wing has its own fuel tank and servo, so the failure of one engine won't affect the other. Underneath the high-quality, iron-on film, the fuselage and wing feature solid, interlocking wood parts. The TwinStar handles much like a single-engine plane, and careful positioning of the centerline ensures that the TwinStar is still flyable even if one of the engines stops! The plane's innovative design also takes the guesswork out of mounting the twin engines: preformed nacelles speed assembly and protect each fuel tank, throttle servo and engine. Specs: wingspan—56 in.; wing area—567 sq. in.; weight—5.5 to .65 lb.; wing loading—24 oz./sq. ft.; length—49.5 in.; engines req'd—two .20 to .40 2-strokes or .26 to .30 4-strokes; radio req'd—4-channel w/5 servos and Y-harness. The TwinStar costs \$180. Hobbico (217) 398-6300; (800) 682-8948; hobbico.com.



▲ WILDCAT FUELS YOUNGBLOOD PERFORMANCE 30 HELIMIX

Designed especially for hardcore 3D flyers, this new fuel blend is endorsed by champion pilot Curtis Youngblood. He explains, "I'm always looking to improve the products that I fly. So I was happy to team up with Wildcat and Klotz to take helicopter fuel to the next level." The new fuel is designed to smoke less during full-power flight but still properly lubricate and protect the engine. The fuel's high-viscosity oil provides a better seal between the piston and the sleeve; this, in turn, allows for higher compression and more power. Because the oil is so viscous, Wildcat only needs to use 18 percent by volume, so the fuel has a higher percentage of methanol and nitromethane for the combustion process; this also translates into more power.

Wildcat Fuels (859) 885-5619; orders only (888) 815-7575; wildcatfuels.com.



▲ NORTHEAST SAILPLANE PRODUCTS BEAD 3D

The Bead may be the toughest foam 3D plane yet! This new indoor or outdoor model is built out of Depron foam but has thicker foam sections to add stiffness, rigidity and crash resistance. A special leading-edge reinforcement strip gives it a smooth rounded shape and spreads the load in the event of a crash. The Bead is an ideal vehicle for a smaller outrunner motor, and its special motor mount allows the motor to be mounted directly on the front of the aircraft. Carbon-fiber landing gear and airframe reinforcement contribute to the plane's high strength and light weight. It comes in many colors, with the graphics preprinted, and includes hardware, decals and a prop-saver adapter. Specs: wingspan—36.5 in.; wing area—347 sq. in.; weight—9.5 to 10 oz.; wing loading—4 to 4.5 oz./sq. ft.

Northeast Sailplane Products (802) 655-7700; nesail.com.



GRAUPNER EXTRA 300L "LEKI"

This built-up aerobate offers performance to please: sharp rolls, quick snaps and huge loops are just a few of its attributes. It comes with a fiberglass cowl and wheel pants, a two-piece wing with an aluminum spar joiner and hinged and pinned flying surfaces. Its rudder is controlled by a pull-pull system that is preinstalled, and the elevator uses two tail-mounted servos for crisp control. Heat-shrink covering and factory-applied decals ensure that it looks as good as it flies. Specs: wingspan—63 in.; length—49.75 in.; wing area—657 sq. in.; weight—8 lb.; power—Axi 4130/16 external rotor brushless motor; price—\$200. **Graupner**; distributed by Hobby Lobby Intl. (615) 373-1444; hobby-lobby.com.

JR VIBE 90 3D

Based on the popular Vigor CS, the new Vibe 90 features many redesigned and upgraded parts that can handle the incredible loads of today's "stick-bending" flying styles. Along with redesigned carbon frames and carbon fins, the drive system has been upgraded with a larger-diameter start shaft that uses a heavy-duty, one-way bearing; a new hardened main shaft with a heavy-duty autorotation assembly; and a beefed-up, newly supported bevel-gear hub. The revised control system features an upgraded high-cyclic swashplate; one-piece CNC 3D center hub with O-ring dampers; composite blade holders and control arms; and an adjustable flybar/blade ratio system. On the tail, the rotor hub design, hub case, pitch lever and control lever have all been upgraded. Even the new painted canopy has been sculpted to reduce drag, so the model flows through flips, rolls, tumblers and pirouettes.

JR; distributed by Horizon Hobby Inc. (800) 338-4693; horizonhobby.com.



ROBART 510 ECONOMY SERIES

The high quality and reliability of Robart retracts are now available for smaller, 6- to 12-pound aircraft. The new 510 Economy series of air-up/spring-down retracts features a positive locking mechanism, so if you lose air pressure, the built-in spring will automatically retract the gear. They include a one-piece aluminum frame, aircraft-aluminum trunnions, an anodized orange frame and a 1/2-inch-diameter air cylinder. Main gear are available in 90 or 85 degrees and with a 3.16-inch-diameter wire; nose gear is available with a 90-degree rail mount or 90- and 105-degree firewall mount and with a 5/32-inch-diameter wire. Both the main and nose gear are also ready to accept Robart RoboStruts (available separately). **Robart** (630) 584-7616; robart.com.



CARL GOLDBERG PRODUCTS STINSON 108

Now you can experience the relaxing, predictable flight performance of the Flying Station Wagon in ARF form. This all-wood model features flaps with dual servo control for extremely slow flight and easy landings, but its dual elevator servos, independent aileron servos and airfoiled tail surfaces let its aerobatic characteristics shine. The Stinson comes with a painted-fiberglass cowl, wheel pants, wing struts, aluminum landing gear and hardware and features a two-piece plug-in wing. Specs: wingspan—81 1/8 in.; wing area—829 sq. in.; length—61 1/8 in.; engine—.75 to 1.08 2-stroke or .91 to 1.20 4-stroke.

Carl Goldberg Products (678) 450-0085; carlgoldbergproducts.com. ★



FLIGHTTEST



“Leo Loudenslager’s
LASER 200 WAS A
WORLD-BEATER, and
this beauty brings back
a taste of that history.”

SEAGULL MODELS LASER 200



A sporty ARF with performance plus!

IN THE LATE 1970S AND EARLY '80S, WORLD AEROBATIC COMPETITION was dominated by Leo Loudenslager and his highly modified Stephens Akro, which he dubbed the "Laser 200." With his Laser, Loudenslager won an unprecedented seven U.S. national aerobatic championships—to date, a feat not duplicated—and one world championship. The Laser's design and success paved the way for the current generation of aerobatic aircraft such as the ever-popular Extra. The original Loudenslager Laser 200 resides in the National Air and Space Museum's Udvar-Hazy Center, and Seagull Models has designed this faithful re-creation of that historic plane but changed its color scheme from blue to yellow.



WHAT YOU GET

The box comes loaded with all of the bits and pieces that you expect to get with a premium ARF. The airplane features traditional built-up balsa and lite-ply construction, and the wood is all laser-cut. There are some decals to apply to complete the trim scheme so you can personalize your plane.



The rudder and twin elevator servos are in the tail. This arrangement provides short, slop-free control linkage.

I rather like the control horns that come with the kit. Instead of having four or five attachment points for the clevis, there are threaded rods that allow very fine horn-length adjustment. The rudder servo and dual elevator servos for slop-free control linkage are mounted in the tail.

I used high-torque digital servos all the way around, but to fly this airplane as it's intended to be flown, there's probably no need for anything bigger than standard servos, with the possible exception of the rudder. To do this beautiful plane justice, though, I recommend that you use servos with good centering, e.g., Hitec 525MGs and perhaps a 625MG on the rudder. The servos I used are extreme overkill for torque, but hey; too much torque is better than too little.

WING

The model has plug-in wing panels with a wing tube that slides through the fuselage. The tube mates with each panel and keeps the structure rigid. Four wing bolts prevent the wing from rotating. Assembling the two wing panels is exceedingly simple. First, install the CA-type hinges and ailerons. Push a straight pin through the center of every hinge to prevent them from shifting when you fit the aileron into place. Flex the

SPECIFICATIONS

MODEL: Laser 200 ARF
MANUFACTURER: Seagull Models
DISTRIBUTOR: Horizon Hobby Inc.
TYPE: sport-scale aerobatic
LENGTH: 63.4 in.
WINGSPAN: 68.75 in.
WING AREA: 735.6 sq. in.
WEIGHT: 10.25 lb.
WING LOADING: 32.1 oz./sq. ft.
ENGINE REQ'D: .91 to 1.20 2-stroke, 1.20 to 1.50 4-stroke
RADIO REQ'D: 4-channel with 6 servos
PRICE: \$234.99

COMMENTS

This is a great plane to use for scale aerobatics, but the pilot figure is way too small to look true to scale.

HIGHLIGHTS

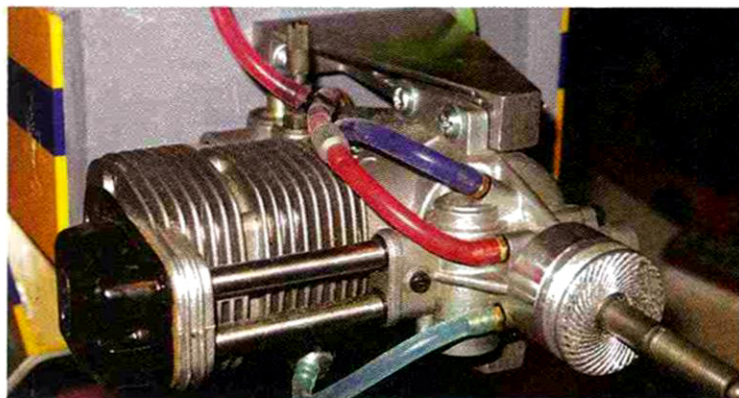
- Great scale looks
- Easy construction
- Wide range of flight profiles

aileron to its maximum deflection, and wick four drops of thin CA into each hinge slot; then flex the aileron in the other direction, and repeat with a couple more drops on the other side of the hinge.

The aileron servos are attached to the wing hatches, and the servo arms protrude from the wing. I used 12-inch servo extensions on the servo leads to make sure that they would reach the receiver with some slack. I used shrink-wrap to secure the connectors. Included with the kit are some really nice control horns. Be sure to adjust the aileron horns so that they are the same length. With my setup, 18mm seemed to work out just right.

FITTING OUT THE FUSELAGE

A metal engine mount is included, and blind nuts come installed in the firewall. They are positioned to allow the use of a



The YS 1.40 engine is a perfect choice for the Seagull Laser 200. Plenty of power!



The tail surfaces are rigged with support wires. Their attachment is simple and quick.



LEO LOUDENSLAGER & THE LASER 200

YOU CAN NO MORE TALK ABOUT THE LASER 200 WITHOUT MENTIONING Leo Loudenslager than you can talk about the Pitts Special and not mention Curtis Pitts. These landmark airplanes are the direct result of the extraordinary people behind them.

Leo was the primary cause of the demise of the Pitts Special as the competition aerobatic airplane. Although the Pitts armada pretty well cleaned the collective clocks of the Europeans and their Czech Zlins in the early '70s, the writing was on the wall: the biplane's day was nearing its end, and—competitively speaking—Leo's monoplanes marked their sunset.

By the time I flew Leo's airplane in 1973, I had been a Pitts pilot for years and had a fair amount of time in the Zlin. As I climbed out of Leo's plane, I knew that I had seen the future. That airplane was his Stephens Akro—the bird from which the Laser evolved.

It was almost a given that Leo's airplane would be in innumerable pieces up to a week before any national contest began. That's because he was always redesigning and rebuilding it. By the time he had finished, only about 10 percent of the original design was still in use—the tubing from the wing back to the tail.

Gradually, as the canopy lines came down and the turtle deck flowed smoothly into the flight deck, the Laser we all recognize emerged. Inside, however, were a million little secrets known only to Leo. He was, for instance, an absolute weight freak. He went to such extremes as painstakingly spot-drilling the canopy frame's

inside surface and removing aluminum halfway through it. He shaved 12 pounds off the motor just by grinding away unnecessary bosses and casting flashing. We accused him of having had a buttectomy to save weight because it didn't look as if there were anything back there holding his jeans up.

And he knew exactly how to make the airplane behave in the way he wanted. A careful examination of the wings showed that he sometimes used model-airplane trim tape along the leading edges to trip the airflow more predictably during snap rolls. Later, that mutated into his lapping the edges of the paint trim in such a way that they, too, controlled airflow separation.

Until he died in a tragic motorcycle accident a few years ago, Leo was one of the most driven, most intensely focused people I have ever known. He gave me my first glimpse into the mind of a true champion, and he went on to win seven consecutive national contests and a world championship. He and his airplanes were unbeatable because he didn't simply strive for perfection; he exceeded it by a wide margin. He rewrote the book on aerobatics and set new standards that, even today, can be met by only a few pilots.

Leo was an absolute original who left an indelible mark. And we miss him mightily.

—Budd Davisson

Visit Budd on the Web at airbum.com.

wide range of engines; I would have preferred to mount my engine inverted to help preserve lateral balance. The side-mounted engine does, however, preserve the plane's scale outline, and it still performs very nicely. Since I used an engine that is on the larger side of the recommended range, I chose heavier control-linkage hardware for the tail group. I don't believe that heavy-duty hardware is necessary for the plane's safety or performance; I simply wanted to offset the extra weight under the cowl with something functional. And I think that the heavy-duty hardware looks cool.

The supplied fuel tank fits nicely just behind the firewall and comes with

instructions to install a third line to fill and empty the tank. When I trial-fit everything together with the tank in place, the fuel fittings protruded about $\frac{3}{4}$ inch beyond the firewall. When I installed the YS 1.40FZ in the recommended position, the back of the engine interfered with the fuel lines. Because the YS engine pressurizes the fuel-delivery system, I was able to move the fuel tank back and out of the way. I extended the fuel-tank floor backward with two pieces of balsa and CA, and I built a stopper to prevent the tank from moving forward.

The engine cowl is massive and provides plenty of cooling air. This cowl is so big that it easily fits over the engine (without muffler)

without your having to make any kind of cutout. Since the air inlet is so big, I could not go with the rule of three times the exit area for proper airflow. I decided to cut a semicircle out of the bottom rear of the cowl and remove material just above the valve cover. I also made a cutout for the stock YS muffler and a hole to allow access to the mixture-adjustment screws. The cowl is held on by four screws, but after the first flight, I added two more screws for extra security.

TAIL GROUP

The horizontal and vertical stabilizers are attached next, but not before the elevators have been hinged into place. Attach the rudder



after you've glued on the vertical stab. The elevator halves are independent, so there's no need to worry about a joiner wire, and the tailwheel is a separate assembly. I really like having the tailwheel assembly separate from the rudder because it eases installation and reduces the stress on the rudder hinges. It also looks great.

Perhaps the most critical step when building this plane is to ensure that the horizontal stabilizer is square with the fuselage centerline. If this measurement is off, the plane's handling will be unpredictable. Measure back from the rear of the canopy to the tips of the elevators, adjust the stabilizer

until it's square, and then glue it into place with a generous amount of epoxy.

Among the neatest scale touches are the functional wire tail braces. Make these by fitting attachment points to the stab and fin and then stringing rigid wire between them with 2-56 clevises on one end. Bend the other end, clip it to length and secure it with keepers.

COMPLETION

With everything in place and double-checked, nothing much remains but to check the CG and set up the radio. To balance the model, I installed the battery just forward of the wing tube. I placed the switch and charging jack on the left side of the plane to keep it out of the greasy exhaust, and I put the pressure-relief and fuel-fill fittings on the same side. The recommended control throws provide very scale-like flight characteristics—not hardcore 3D performance. It had been a while since I set up a scale aerobatic plane, and the throws didn't look like much to me, but believe me, they are plenty effective! Rolls are slow and graceful, and the model holds a very steady knife-edge at about 1/2 throttle.

Seagull Models has once again produced a winner. With its excellent scale looks and stable, confidence-inspiring performance, I bet that it would make the late, great Leo Loudenslager proud. ✦

See the Source Guide on page 151 for manufacturers' contact information.

The YS 1.40FZ engine provides plenty of power for any maneuver that you might want to try. Combine it with an APC 18x6 propeller, and the setup is a real stump-puller! Of course, the real Laser didn't have limitless vertical climbs, but they sure look impressive.

CONTROL THROWS

Elevator: $\pm 7/8$ in. (high); $\pm 3/8$ in. (low); expo: 20%

Aileron: $\pm 3/8$ in. (high); $\pm 3/16$ in. (low); expo: 15%

Rudder: $\pm 1 1/4$ in. (high); $\pm 3/4$ in. (low); expo: 10%

GENERAL FLIGHT CHARACTERISTICS

➤ **Stability.** This is a very stable plane for an aerobat, but it isn't suitable for beginners.

➤ **Tracking.** Takeoffs require rudder correction, but knife-edge has very little pitch coupling with rudder applied.

➤ **Aerobatics.** This is a great plane for scale aerobatics. Loops are big, rolls axial and snaps crisp, and they all look awesome.

➤ **Glide performance.** Dead-stick landings are no problem if you have a little bit of altitude to work with.

➤ **Stalls.** Like most aerobats, its stall characteristics are predictable, and recovery is quick and easy.

PILOT DEBRIEFING

From the first takeoff to the last landing of the day, the Laser 200 is a joy to fly. The initial setup spelled out in the manual provided beautiful scale performance and resulted in a very enjoyable aerobatic sport plane. With the YS 1.40FZ, there's plenty of power to do giant loops the size of the sky, and I had a great time just buzzing the runway doing stall turns and hammerheads at either end. Rolls can be axial with the proper application of elevator and rudder. I didn't see a need for any aileron differential.

After a few flights, I moved the CG rearward (but within the suggested range) to do more advanced maneuvers such as snaps and flat spins. A couple of ounces of lead in the tail made a pretty big difference to how the plane handled. It went from being a very nice sport flyer to being a much more capable stunt plane. Snap rolls were much quicker, and flat spins became much flatter. With some tweaking, I was easily able to get the plane to do beautiful flat spins and really great barber poles. All in all, this is an excellent RC platform for doing aerobatics—with a bit of nostalgia for flavor.

GEAR USED

RADIO: JR XP 8103 with Hitec HS-5625MG and HS-5925MG servos

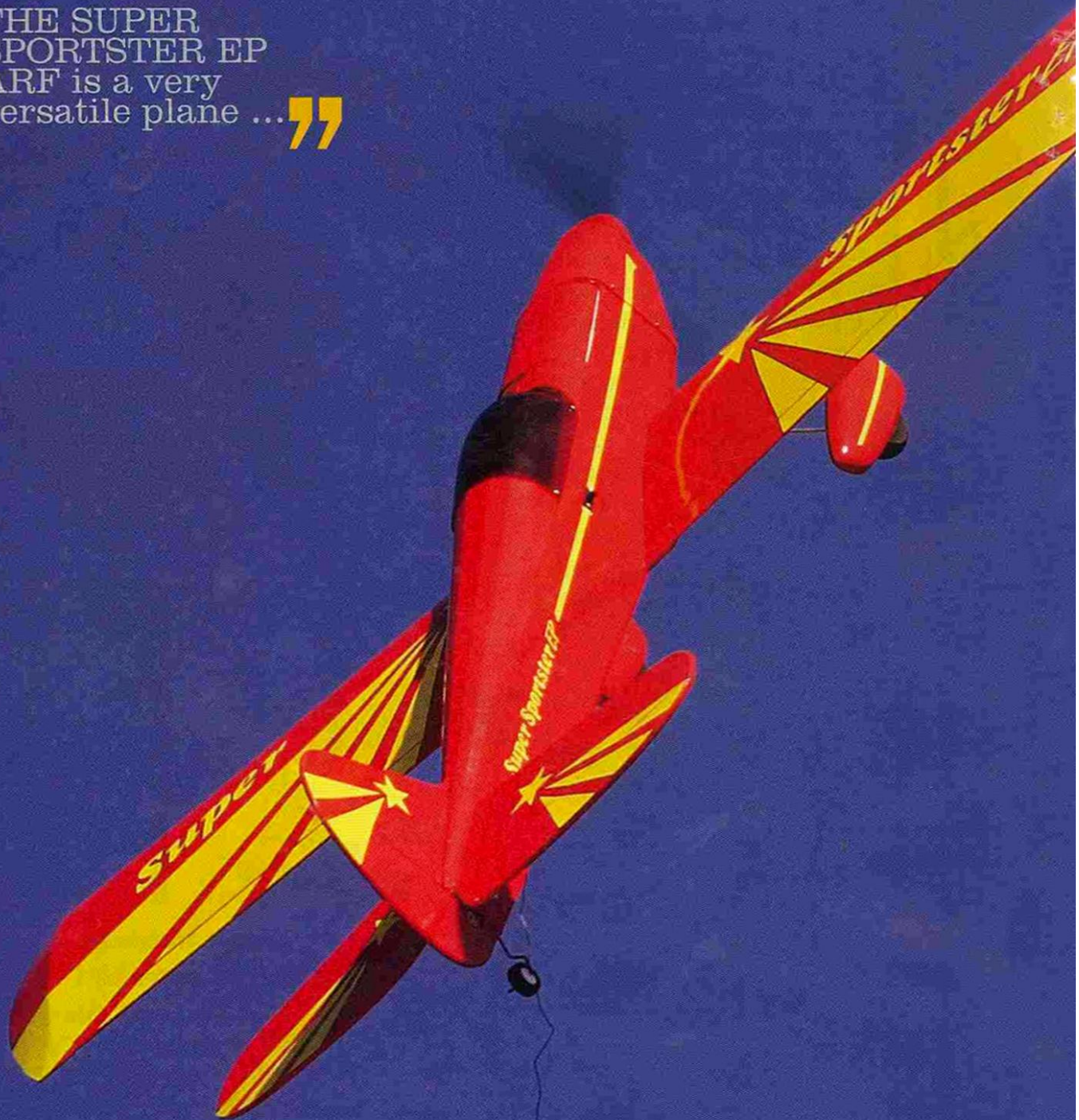
ENGINE: YS 1.40 Sport

FUEL: Wildcat 30% Helimix

PROP: APC 18x6



“THE SUPER
SPORTSTER EP
ARF is a very
versatile plane ...”

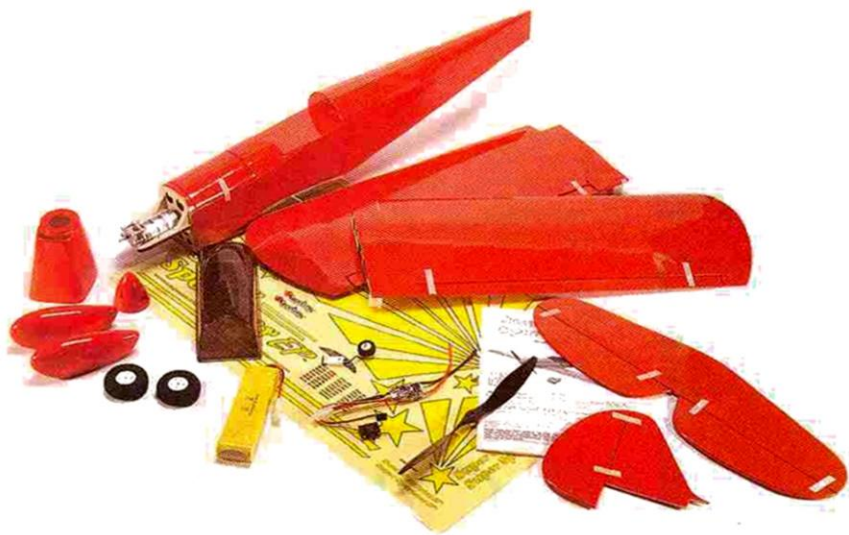




ELECTRIFLY SUPER SPORTSTER EP ARF

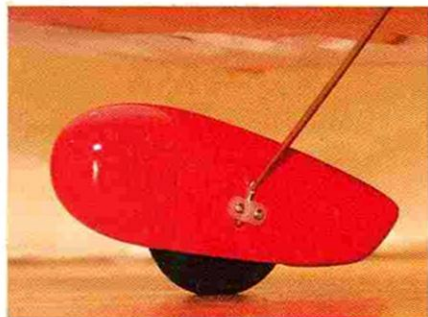
An '80s classic electrified!

IT INSPIRES BEGINNERS AND BROADENS THE SMILES OF ADVANCED pilots—that's how I like to describe the Super Sportster EP from Electrify, which took its very successful glow-powered Super Sportster, applied some modern refinements and converted it to electric power for an exceptional value. The Super Sportster EP ARF is a solid choice for those who are ready to move up from a high-wing trainer, and it's a noble aerobatic trainer for pilots who are looking to hone their skills. The semisymmetrical airfoil aids in maintaining low-speed stability, and the low-wing design and full-length ailerons facilitate crisp aerobatics, all in a package that offers the quiet and convenience of electric flight.



QUITE A KIT

I've built several almost-ready-to-fly (ARF) models, and I'm particularly impressed with the Super Sportster. From the start, it was obvious that it isn't your run-of-the-mill ARF. The kit is very complete and includes well-illustrated instructions, a painted fiberglass cowl and wheel pants, a plastic canopy, decals, wheels, a prop and spinner, hardware, steel main landing gear and a steerable tail-wheel. The power system is factory-installed and consists of a Speed 550 motor mated to a 2:1 gearbox along with a wired 30A speed control, and—get this—a 7-cell, 2100mAh Ni-Cd is included. Nice touch!



A simple and secure method is employed to attach the wheel pants to the wire landing gear.



I used small screws to attach the canopy.

The airframe is built entirely of balsa and plywood and is covered in a bright red polyester film. Even though all the hardware and accessories serve their functions well, I like the model so much that I felt it deserved an aluminum spinner instead of the plastic one provided. The cowl and wheel pants are made of nicely molded fiberglass and have been painted to match the covering; they never showed any signs of cracking while being handled (always an indication of good quality).

To give you an idea of the thought that has gone into this model, the control-rod tubes for the elevator and rudder are installed along with an antenna tube that runs the length of the fuselage. The 24-page instruction manual details the assembly steps very clearly with great photos.

CONSTRUCTION NOTES

Construction—or should I say assembly—starts with the wing and is very straightforward; I was able to assemble the Super Sportster in only a few hours. The model comes with all of the control surfaces hinged, but you do have to glue the hinges into place. I started by laminating the two plywood wing joiners together and joining the wing panels with 30-minute epoxy. While the epoxy set, I used the supplied hinges and thin CA to hinge the ailerons.

With the wing assembled, I placed it in the wing saddle to check for proper alignment, and it fit precisely in the fuselage. The supplied wing hold-down bolts are made of steel and firmly hold the wing in place. When I was satisfied with the wing mounting, I unscrewed it and followed the instructions for installing the aileron servo. Five minutes later, I attached the control rods to

SPECIFICATIONS

MODEL: Super Sportster EP ARF
MANUFACTURER: Electrify
DISTRIBUTOR: Great Planes Model Dist.
TYPE: electric aerobat
WINGSPAN: 48 in.
WING AREA: 383 sq. in.
LENGTH: 39 in.
WEIGHT: 52 oz.
WING LOADING: 19.5 oz./sq. ft.
MOTOR INCLUDED: Speed 550 geared 2:1
RADIO REQ'D: 4-channel w/3 miniservos (aileron, elevator, rudder, throttle)
FLIGHT DURATION: 6 to 7 min.
PRICE: \$119.99

COMMENTS

The Electrify Super Sportster is a nicely detailed model with excellent flight characteristics. The kit is well appointed and includes a factory-installed power system and a 7-cell, 2100mAh Ni-Cd battery.

HIGHLIGHTS

- High-quality, all-wood construction
- Factory-installed, Speed 550 motor mated to a 2:1 gearbox with prewired 30A ESC
- Broad flight envelope



There are cooling holes on the bottom of the fuselage, just behind the wing.



The cowl has an air scoop to channel cooling air through the fuselage.



IN THE AIR

The Super Sportster is great-looking aircraft with a style and sleek lines that are reminiscent of the planes of the '50s. In the air, the plane is very docile and predictable; it required only a few clicks of up-elevator for straight and level flight. Its speed range is adequate for loops, rolls and inverted flight. A more powerful power system would really make the model come alive. Flying within the pattern is one of the most enjoyable aspects, as the Super Sportster tracks exceptionally well and settles in for final approach as well as any plane in my fleet. Landings and touch-and-go's are exceptionally fun!

CONTROL THROWS

Aileron: $\pm 3/8$ in. (high), $\pm 1/4$ in. (low);
expo: 35% (high), 25% (low)
Elevator: $\pm 1/2$ in. (high), $\pm 3/8$ in. (low);
expo: 35% (high), 25% (low)
Rudder: ± 1 in. (high), $\pm 3/4$ in. (low);
expo: 35% (high), 25% (low)

GENERAL FLIGHT CHARACTERISTICS

► **Stability:** the Super Sportster has outstanding stability at all speeds and makes slow pattern work, touch-and-go's and landings a breeze.

► **Tracking:** aim the plane in any direction and attitude, and it tracks with very few corrective inputs. Frankly, the Super Sportster flies as if it were a much bigger aircraft.

► **Aerobatics:** the large rudder and elevator surfaces provide immediate and precise responsiveness, while the ailerons, due to their smaller size, limit roll authority and make rolling maneuvers a bit slow. Loops, rolls and inverted flight are all possible, though.

► **Glide performance:** with its light wing loading, the plane seems to glide forever. Just take care not to use too much up-elevator and induce a stall.

► **Stalls:** power-on and power-off stalls are graceful. The model has no bad stalling tendencies at all; to recover, just drop the nose to regain speed and control.

PILOT DEBRIEFING

This is a well-built, all-wood aircraft that never fails to gather a crowd whether it's in the pits or in the air. Because of its large rudder and elevator control surfaces, I highly recommend that you use dual rates. This is a must for takeoffs, and it also smoothes out your flights and landings. With the Super Sportster's wide speed range, gentle stall characteristics and high glide ratio, slow-speed approaches are a thing of beauty: the plane just seems to hang in midair. Like any model aircraft, once you get to know its flight characteristics, you can settle down and really enjoy this plane for a variety of flying styles.

the preinstalled torque rods, measured for proper control throw and moved on to the final assembly of the fuselage and tail.

► **Tail feathers** The rear of the fuselage is notched for the vertical fin and the stabilizer. After I had removed the covering on the fuselage, stabilizer and fin, I aligned them with the wing for a trial-fit. They fit very well, and when they were properly aligned, I applied 5-minute epoxy and taped them into place while the epoxy cured. After it had cured, I attached the tailwheel assembly to the rudder and fuselage, as directed. Like the ailerons, the elevators and rudder are already hinged and required only a few drops of thin CA to complete. Be sure to attach the elevators before you hinge the rudder.

► **Fuselage assembly** The landing gear is held in place with nylon straps and wood screws on the bottom of the fuselage. At first, I had concerns about this setup, but I found that the landing gear is not made of the typical flimsy aluminum used in other models, and after a dozen flights, I haven't had any problems with the gear's bending or coming loose.

I installed the elevator and rudder servos

in the plywood servo tray and ran the pushrods through the preinstalled pushrod tubes. The pushrods already have an L-bend in one end, and the other end is straight to mate with the included pushrod connectors. Pushrod installation and adjustment were simple and quick. The battery hatch is between the canopy and cowl and allows quick and easy battery changes. The battery compartment has plenty of room for the 7-cell battery pack or a comparable lithium pack.

► **Finishing** The generous supply of decals included in the kit adds the final touch to your Super Sportster. Applying these decals was probably the most challenging part of the assembly and took me well over an hour. After I had finished installing the rest of the equipment, including the prop and battery, I checked the center of gravity and was ready to head to the field.

The finished flying weight of my model was exactly what the specs said it should be: 3.25 pounds (52 ounces). This weight is excellent for a model of this size, and with its wing area of 383 square inches, it has a wing loading of only 19.5 ounces per square foot. The power system produced 225 watts of power, which worked out to 69 watts/pound—very adequate for sport flying.

BUILDER'S FINAL THOUGHTS

In the world of ARFs, quality is often sacrificed for more competitive pricing, but I didn't find that to be the case here. The Super Sportster EP ARF is a very versatile plane and is a perfect example of why ARFs are so popular these days. The construction quality is excellent, assembly is fast and trouble-free, and the flight characteristics are equal to those of many high-performance planes. The ElectriFly Super Sportster EP ARF is an improved rendition of a tried-and-true classic that will continue to inspire beginners and put smiles on the faces of advanced pilots. ✚

See the Source Guide on page 151 for manufacturers' contact information.

GEAR USED

RADIO: JR XP9303 transmitter & JR 770 receiver

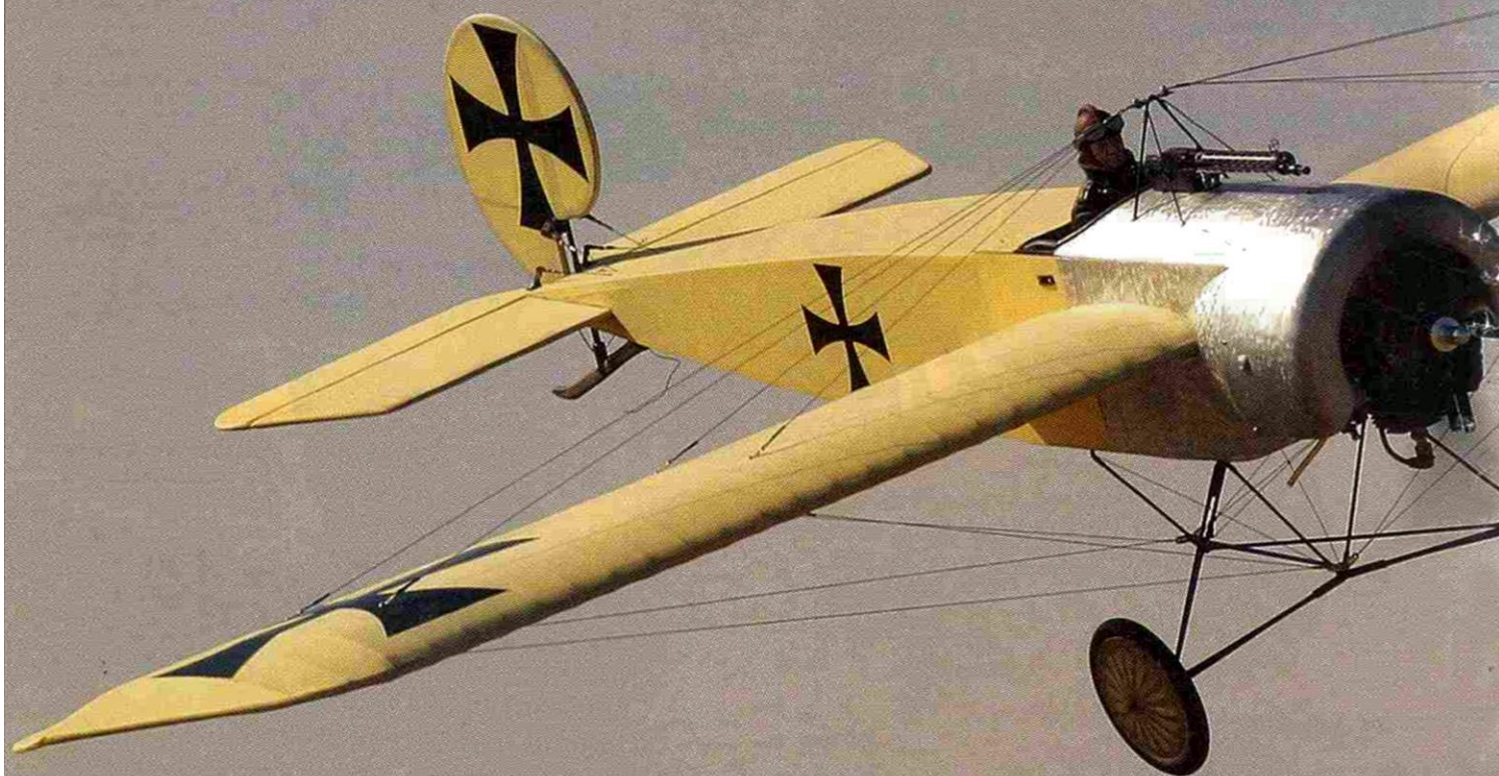
SERVOs: Hitec HS-81

MOTOR: Speed 550 geared 2:1 w/30A ESC (included)



FLIGHTTEST

“... THE EINDECKER
is so easy to fly that
any pilot will feel
comfortable with it.”



SR BATTERIES INC.

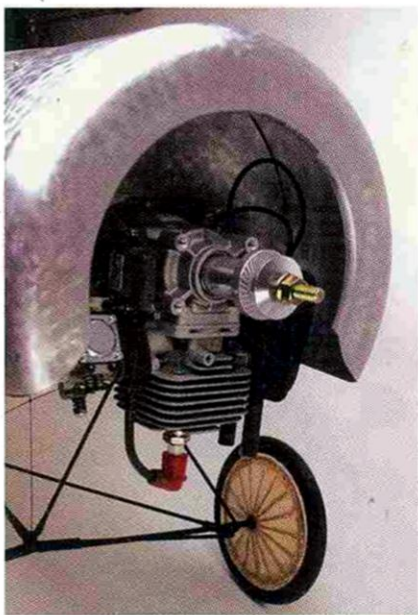
Eindecker

Antique look—modern flight performance!

I'M A WW I BUFF, and when I first I saw SR Batteries' 1/4-scale Eindecker E1 fly, I knew I had to add it to my hangar. The full-size E1 was unique among its contemporaries in that it could be transported by truck. It was also one of the first airplanes with synchronized machine guns that could shoot through the prop arc without damaging the prop. The SR Batteries kit version is also unique because it uses many new building techniques and concepts and is designed for gas, glow and electric power. I could hardly wait to get started!



E1



The large cowl offers more than enough room to perform routine motor maintenance.

KIT FEATURES

The plywood and balsa ribs are all laser cut, and the landing gear and hard support wires come ready for installation. A Lexan windscreen, spun-aluminum cowl and high-quality hardware are also included. Four 72x24-inch full-size plan sheets detail all the parts needed for construction. My first step was to read the 108-page manual and familiarize myself with the construction process.

► **Wing assembly** Before constructing the wing, I built the wing-squaring jig to square the wing ribs when I assembled them. I put talcum powder on the two composite spars to make it easier to slide the ribs into their proper locations. The box contained two, 1-inch-square, approximately 13-inch-long blocks of balsa; I set the spars on these to hold them off the table during assembly. At

this point, I used the two supplied "combs" and placed one near the leading edge and one near the rear spar. They allowed me to set the ribs at the proper spacing and alignment. The plans show how to make a little "keeper" by using a rubber band to hold the leading edge and the rear spar together and properly aligned.

I slid my squaring jig over the main spar and squared up the root rib. When I was satisfied that everything was correctly positioned, I glued the root rib in and tacked down the ribs that were closest to the root. After tacking down four ribs, I moved the two combs to the next five ribs toward the wingtip so that the remaining ribs would be aligned with the ribs that I had already glued; then I tacked down the next four ribs. I continued this process until I had tacked down all the ribs. This alignment system worked really well.

When I glued on the trailing edge, I left room for the box that the servo tray fits into. I made the aileron-servo tray, installed the servo on it, and then glued the unit into the aileron-servo box at the rear of the wing. I installed the blocks to which the anchor flying wires will be connected. Next, I assembled the wingtips, which were easy to construct, and then I built the ailerons, which are made up of small ribs. The handy little comb jigs helped me to make short work of the assembly.

► **Horizontal stabilizer** A certain amount of lamination is required for the tail-feather construction. The stabilizer's leading edge is a composite tube, and the trailing-edge requires lamination. The stabilizer and elevator tips are made of laminated balsa over a plywood framework. This construction method creates a strong, light piece.

At this point, I decided to go with the

SPECIFICATIONS

MODEL: Eindecker E1

MANUFACTURER: SR Batteries Inc.

TYPE: 1/4-scale WW I monoplane

LENGTH: 67 in.

WINGSPAN: 100 in.

WING AREA: 1,700 sq. in.

WEIGHT: 16.5 lb.

WING LOADING: 22.4 oz./sq. ft.

POWER REQ'D: 1.20 or larger glow; gas G-26; electric Axi motor 4130/20

RADIO REQ'D: 4-channel w/5 servos (rudder, elevator, 2 ailerons)

PRICE: \$349.95

COMMENTS

The Eindecker E1 is a joy to build. It's also easy to assemble and disassemble at the field and has great flight performance.

HIGHLIGHTS

- Spacing combs for wing assembly
- Easy wing alignment using the root-rib jig
- Working tailskid

pull-pull system instead of a pushrod connection. The control horns are supplied, and SR offers a complete pull-pull system for \$19.95. I built the two elevators; their leading edge is laminated balsa, and the trailing edge is a composite tube.

► **Rudder** All the pieces of the rudder are laser cut and fit together quite well. Here, again, the use of laminated balsa over plywood made it very easy to shape the rudder. The rudder uses a short, composite tube that slides into the center of the spar; this reinforcement facilitates control and makes a strong rudder.



It isn't steerable, but the scale tailskid nevertheless offers excellent support and some shock-absorbing qualities.



These two comb spacers (one fore and one aft) provide proper spacing and alignment for the wing ribs.



IN THE AIR

For the SR Batteries Eindecker, I used the Zenoah 26 gas motor with a stock muffler, a Zinger 18x6 prop and a 40:1 gas/oil mix. This combination provided plenty of power to pull the 16-pound plane around the sky with authority. Slightly better performance can be achieved by using a 20x6 prop.

CONTROL THROWS

Elevator: $\pm 3/4$ in. (low); expo: 0%

Aileron: ± 1 in. (low); expo: 0%

Rudder: $\pm 2 1/2$ in. (low); expo: 0%

GENERAL FLIGHT CHARACTERISTICS

► **Stability:** this plane handles very well at high speed. At slow speeds, the airplane remains stable right up to the stall.

► **Tracking:** the SR Eindecker tracks very well on the ground because of its large rudder, even though there is no tail-wheel—just a tailskid. In the air, the plane flies straight and true, even through low speed turns. Rudder is required to make really smooth turns.

► **Aerobatics:** this is a terrific, scale WW I plane, and it will do all of the maneuvers that the full-size plane could do. The model flies each maneuver with grace and authority. I made sure that I had plenty of altitude before I attempted any maneuver, especially the first time.

► **Glide performance:** if you set the balance correctly, the plane will glide well with $1/4$ throttle. Without power, you will need to keep the nose pointed downward to maintain a solid glide without stalling.

► **Stalls:** to get it to fully stall, I had to put the airplane at a 45-degree angle and cut the power to idle. It took longer than I expected to recover completely, mainly because it's so large. Just be sure to have a fair amount of altitude before you do any stalling maneuvers. To recover, just point the nose slightly downward and let the Eindecker build up a little speed before you level off.

PILOT DEBRIEFING

I'm impressed by how well the Eindecker flies. The Zenoah 26 has plenty of power to pull this plane around the sky. It took only about 40 feet of runway before the Eindecker was in the air. Once leveled out, the plane can easily fly at $1/2$ throttle for an easy and relaxing flight. At full throttle, the motor has plenty of power for any scale WW I maneuver, such as split-S's, loops, or rolls. Just be sure to have sufficient altitude before you attempt any maneuvers because this large plane needs a lot of airspace to perform them. Landing is a piece of cake; I made my approach at a little under $1/4$ throttle until the plane approached the ground, and then I cut the throttle to idle. Just before touchdown, I flared to a great 3-point landing.

► **Fuselage** I laid out the plans and covered them with wax paper. The fuselage is easy to build because everything is clearly marked with very concise directions. My only deviation from the instructions was that I used weights to hold down the plywood fuselage sides to keep them flat while I was building. With the fuselage sides over the plans, glue in the uprights, the gussets and the stringers. At this point, make sure that you are making a right and a left fuselage side. Add the stabilizer mounts and doublers to each side, and then install the bulkheads and servo trays on one of the sides. Make sure that everything is at 90 degrees to the fuselage side.

Put one side on top of the other side. Use weights to hold it in position, and double-check to make sure that the top and bottom are aligned and at 90 degrees. Be sure to check the tail alignment. I glued all the $3/8$ -inch reinforcements into the bulkheads and installed all the bellcranks in the locations shown on the plans. The firewall can be mounted with either side facing out; I used the one with the Zenoah 26 mounting pattern. The other side shows the mounting for an electrical motor. I made the removable hatch that incorporates the wire A-frame for

the flying wires and then the cockpit where the pilot is installed. The A-frame must be set and epoxied into place according to the position shown on the plans. I installed my aluminum cowl on the firewall, making sure that I had $5 1/4$ -inch clearance from the firewall to the back of the prop. I built the two cowl cheeks, covered them with aluminum and glued them into the fuselage side. Be sure to leave the correct amount of clearance for the wing roots. To finish the fuselage, I reached inside and glued in the floor for the fuel tank.

► **Landing gear** The landing-gear joints have to be wrapped in wire and soldered for strength; this takes a little time, but if you follow the instructions, you won't have any problems. The result is a nicely done gear that has shock-absorbing qualities.

► **Covering** The SR-Tex cloth covering offered by SR is one of the best covering materials I have used; I chose a shade called "Antique" for this plane. Be mindful of the application temperature, and it will go on smoothly and without any wrinkles. With the covering in place, I attached the tail feathers. I slid the stabilizer in and glued it, and then I slid the rudder into the tube that is part of a tailskid. This rudder-hinging method is unique and provides a neat rudder-hinging action.

FINAL THOUGHTS

The SR Batteries' Eindecker offers slow flight performance and is so easy to fly that any pilot will feel comfortable with it. It has the high quality and unique construction methods that any modeler will enjoy. The well-thought-out design results in easy setup at the flying field because it requires you to use only four nuts to attach all the flying wires. In the air, its size and scale flying speed will surely impress other pilots. ✈

See the Source Guide on page 151 for manufacturers' contact information.

GEAR USED

RADIO: Airtronics RD 8000, 92778 receiver, 5 94120Z servos

ENGINE: Zenoah G-26

FUEL: gasoline

PROP: Zinger 18x6





“THE EXCELLERON 90 IS A REFRESHING BREAK from 3D-type models that are so prevalent today.”

SPORTSMAN AVIATION

Excelleron 90



Precision aerobat, right out of the box!

LET'S FACE IT: SOMEONE SHOWS UP AT YOUR FIELD WITH a sharp-looking pattern ship, and everyone stops to watch it fly. These models repeatedly catch our attention because of their raw power, beautiful looks and extraordinary aerobatic performance.

Unfortunately, there haven't been many pattern-type models around, especially in almost-ready-to-fly (ARF) form—until now. The new Sportsman Aviation Excelleron 90 from Global Hobby is a refreshing break from the seemingly endless 3D-type models that are so prevalent today. This was one project I looked forward to.



The kit includes three neat covers that go over the aileron servos.

IN THE BOX

The Excelleron 90 is a very complete kit and includes just about everything you need. Other than common modeling tools and adhesives, you need only add a .91 to 1.20 2- or 4-stroke engine, a 2 $\frac{3}{4}$ -inch-diameter spinner, a 4-channel radio with five ball-bearing servos and two 12-inch servo-lead extensions. The Excelleron 90 is CAD-designed and precision-built for light weight and excellent flight characteristics. The kit includes a durable aluminum landing gear, painted fiberglass cowl and wheel pants, a clear molded canopy and a complete high-quality hardware package. I don't know of any other kits that contain a soft-mount engine-mounting system, but this unique feature is included here. I really like the high-definition color

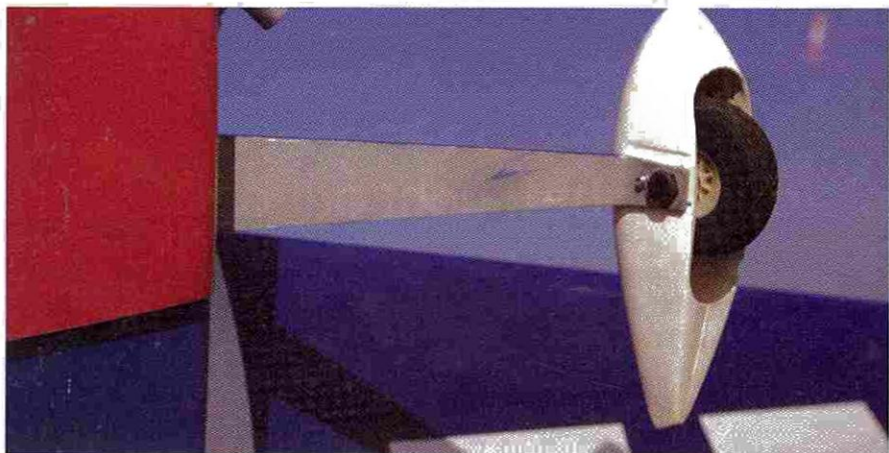
scheme; it's eye-catching. The well-written 44-page instruction manual is filled with more than 60 high-resolution digital photos to guide you through the assembly process.

WING CONSTRUCTION

Like many ARFs, assembly starts with the wing. I hinged the ailerons with the supplied metal hinges; each aileron uses four. Be sure to thoroughly roughen them so that the epoxy really grips them. After I had removed the covering from the aileron-servo cutouts, I installed my Hitec 425BB servos. For the servo leads to reach the center of the wing, you'll need 12-inch servo extensions. The plastic servo fairings that cover the aileron servos are a nice touch. They really clean up the look of the wing; only the servo arm is exposed.

The aileron linkages are unique in that a threaded rod is screwed into a nylon mount and an adjustable nylon horn is threaded onto the rod. The horns must be precisely placed, and the instructions cover this well. The wing joiner is a hefty piece of wood that I doubt will ever break. The top of the joiner is flat, and the bottom has a slight V to accommodate the wing's dihedral. I test-fit the joiner in each panel to make sure that it was correctly positioned, and then I marked it with a pencil. I used 30-minute epoxy and slid the joiner into one of the panels. When the epoxy had completely cured, I slid the other wing panel over the joiner and checked its alignment; it was perfect. I then smeared the joiner and wing root ribs with plenty of epoxy and mated the panels. I used an ample amount of tape to hold them together and wiped off the excess epoxy that oozed from the joint.

I fitted the wing into the fuselage and screwed it down; the blind nuts are factory-



The wheel pants are easy to install and have room for larger wheels, if required.

SPECIFICATIONS

MODEL: Excelleron 90
MANUFACTURER: Sportsman Aviation
DISTRIBUTOR: Global Hobby
TYPE: precision aerobatic pattern plane
WINGSPAN: 66.5 in.
WING AREA: 865 sq. in.
LENGTH: 67.5 in.
WEIGHT: 8.5 lb.
WING LOADING: 22 oz./sq. ft.
RADIO REQ'D: 4-channel w/5 servos
ENGINE REQ'D: .91 to 1.20 2- or 4-stroke
PRICE: \$279.99

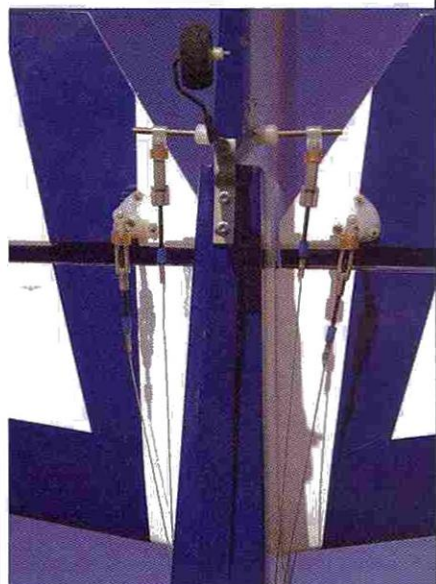
COMMENTS

The Excelleron 90 is an excellent pattern ship that I'm really excited about. It's well built and easy to assemble, and it flies great!

HIGHLIGHTS

- Easy to build
- Complete hardware package
- Nice-looking
- Terrific flyer

installed in the mounting plate. While the wing was in place on the fuselage, I installed the belly pan using silicone adhesive, as recommended. This worked very well. I also installed the stabilizer and aligned it with the wing after I had removed the covering from the stabilizer slot. Instead of using solid pushrods, the Excelleron 90 uses pull-pull cables both for the elevator and rudder control surfaces.



The rudder and elevators use a cable pull-pull system for precise control.



IN THE AIR

The Excelleron 90 is one smooth-flying airplane! It isn't a rocket in vertical with the Magnum .91 and Zinger prop pulling it, but they certainly pull it well enough to make huge loops and vertical climbs. Any maneuver in the Sportsman and Intermediate patterns can be performed with ease.

CONTROL THROWS

Aileron: $\pm 1\frac{1}{8}$ in. (high); ± 1 in. (low)

Elevator: $\pm 1\frac{1}{2}$ in. (high); $\pm 1\frac{1}{8}$ in. (low)

Rudder: $\pm 2\frac{3}{4}$ in. (high); $\pm 2\frac{1}{2}$ in. (low)

GENERAL FLIGHT CHARACTERISTICS

>Stability: as expected, the Excelleron 90 is very stable and doesn't show any bad characteristics.

>Tracking: as a pattern plane should, the Excelleron 90 tracks very well at all speeds.

>Aerobatics: the Excelleron 90 lives for aerobatics! It will do any pattern-type maneuver with ease and grace.

>Glide performance: if the plane is balanced correctly, it will glide without any problems, but be sure to keep the nose down to prevent any stalls.

>Stalls: when this plane climbs and you cut the power to an idle, it will tip-stall; with a little speed, it recovers nicely.

PILOT DEBRIEFING

Every time I fly the Excelleron 90, I'm very impressed with its performance. The Magnum .91 2-stroke has plenty of power to pull this plane around. I cruise around at just above $\frac{1}{2}$ throttle and only use full throttle when climbing. I just love the plane's feel when it's flying inverted; the slightest touch of down-elevator will hold it level. All maneuvers are executed with surgical precision; if you want to roll or loop, the Excelleron 90 will perform them with the slightest of stick movements. The ailerons are very responsive, and if you use the recommended throws, it's a good idea to dial in some expo. I set the elevator throw as recommended, and it is pretty smooth for pattern flying.

The Excelleron 90 is an easy plane to land. Just line up the runway, drop the throttle to idle, and adjust the controls for your flight path. It requires almost no elevator until you flare, and then just a touch, at that. When I came in for my first landing, I cut the throttle down to about $\frac{1}{4}$ and had too much speed to land. I went around again, and on my next approach, I cut the throttle down to a little above idle, and the plane floated down gracefully. You can perform perfect 3-point landings with no effort at all.

See the Source Guide on page 151 for manufacturers' contact information.

FUSELAGE ASSEMBLY

I first test-fit the servo tray in the fuselage and made sure that the cutout for the throttle servo faced forwards before I glued it into place. It also needs to be oriented so that the $\frac{1}{4}$ -inch-thick plywood blocks that raise the rudder servo are on the left side of the fuselage. I then installed the throttle, rudder and elevator servos. Next, I installed the 420cc fuel tank. Its neck fits into a hole in the firewall, while the back of it rests in the cutout in the forward bulkhead. I packed the tank compartment with foam rubber to absorb vibration.

I glued the vertical fin into place with 30-minute epoxy after I had removed $\frac{1}{2}$ inch of covering from its bottom. I then hinged the elevators. Next came the tail-wheel; you must install it before you hinge the rudder. As mentioned, the elevators and rudder use a pull-pull system for a very precise control response. There are three control horns—two for the elevators and one for the rudder. I found the pull-pull system very easy to install and set up, as all of the guide tubes are already installed, and all of the necessary hardware is included. All you have to do is follow the manual; easy!

ENGINE INSTALLATION

The engine is soft-mounted, and installing the soft mounts is a little different from installing standard hard mounts. First, assemble the eight aluminum plates and four rubber isolation mounts to make four mounts. Then bolt these to your engine of choice; I used a Magnum .91 SLX 2-stroke, and there was ample room in the engine compartment for it. Install the spinner backplate on the engine, and then place it on the hardwood beams, leaving a minimum $\frac{3}{32}$ -inch clearance between the backplate and the front of the fuselage. Without this clearance, the spinner could rub on the front of the fuselage. (Soft-mounted engines tend to oscillate when idling. Any oscillations seen while idling will stop as the engine goes to full throttle.) It's highly recommended that you use a thread-locking compound on the bolts that secure the mounts; you wouldn't want them to loosen in flight! Fitting the cowl was an easy task, and I needed to cut openings for the muffler and needle valve. I installed a fuel filler directly in the side of the fuselage. At this point, I set up the landing gear. The mounting holes are predrilled, and the blind nuts come installed. Installing the wheels and wheel pants takes only a few minutes.

FINAL ASSEMBLY

Almost done now! I trimmed the canopy and prepared it for installation. Next, I secured a Williams Bros. pilot with silicone adhesive. After checking the canopy's fit, I again used silicone to attach it. Following the manual, I set up the control throws and balanced the model. Ready to go flying!

PARTING THOUGHTS

The Sportsman Aviation Excelleron 90 can do it all! It's an ideal ARF for freestyle aerobatics, F3A pattern, or artistic-type aerobatics. The Magnum .91 2-stroke is a good match for the airframe; I can only imagine how a 1.20 4-stroke would pull this baby along! You'll enjoy this masterful flying design; I certainly do! ✈

GEAR USED

RADIO: Hitec Eclipse 7 transmitter w/RCD 3800 receiver and 5, 4258B Deluxe servos

ENGINE: Magnum .91 SLX 2-stroke

FUEL: Powermaster 15%

PROP: Zinger 14x5



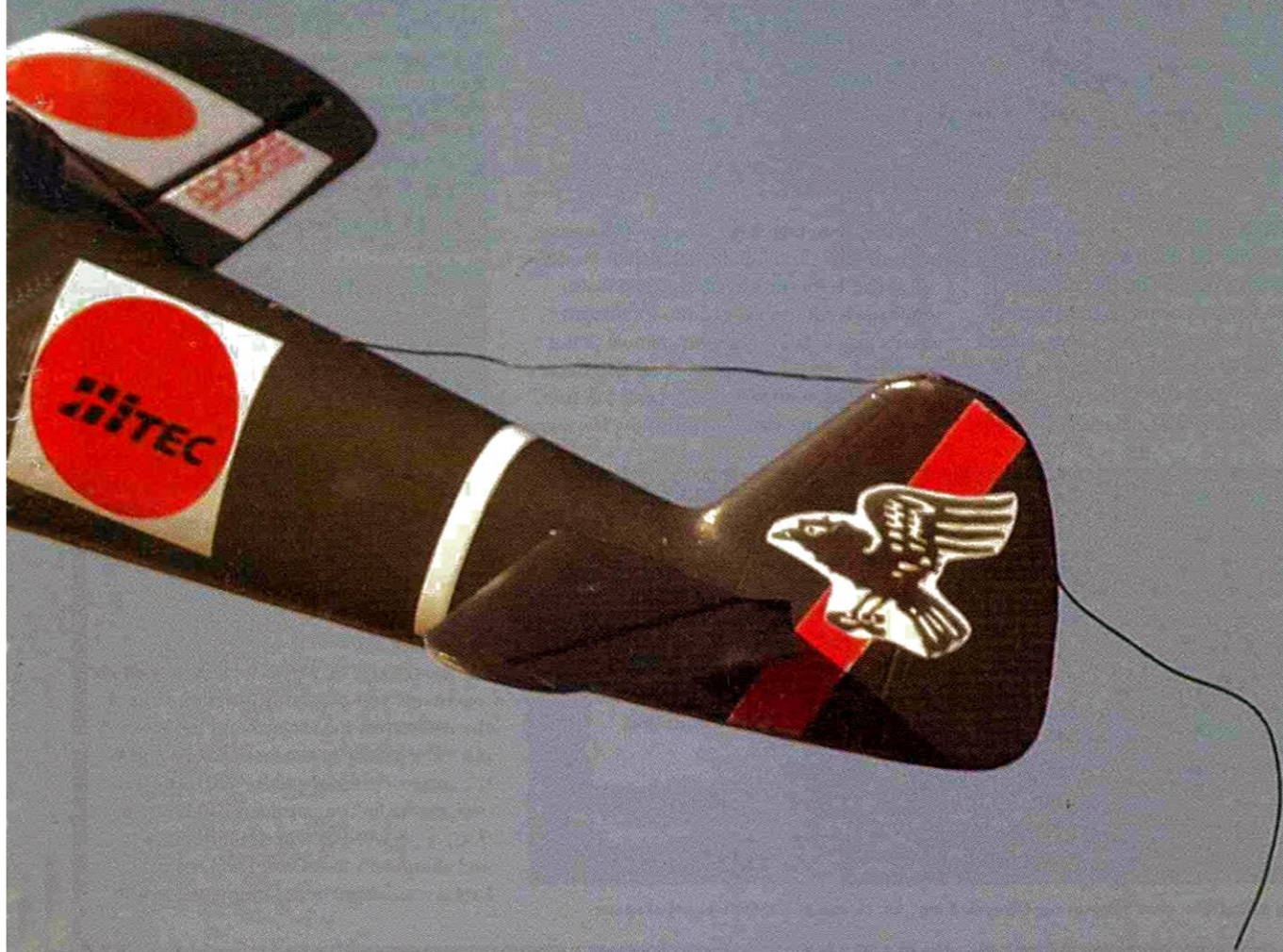
FLIGHTTEST



HOBBY LOBBY INTL.

HAYABUSA

“
With its agility and
exceptional power,
THE HAYATE ROCKS!
”



No-fuss warbird fun

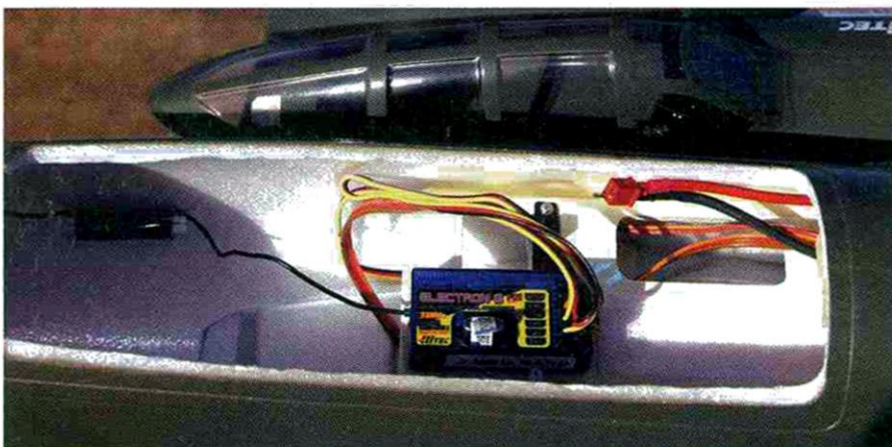
BROUGHT INTO SERVICE IN 1944, THE NAKAJIMA KI.84 HAYATE (Allied code name "Frank") is generally considered the best Japanese fighter aircraft of WW II. The Hayate was a match for many advanced Allied fighters and was often their superior in many ways. The well-armored, well-armed fighter was fast and, most important, very maneuverable. It could out-climb and outmaneuver the P-47 Thunderbolt and P-51 Mustang. Now you can stage your own "dogfights over Okinawa" with Alfa Model's new Hayate Japanese fighter.



KIT CONTENTS

Expertly molded out of factory-painted, extruded polystyrene foam, the airframe comes fully assembled and has a hardened surface to resist dings and hard plastic skins where the model contacts the ground. The ailerons and elevators come hinged, and all of the pushrods are installed and ready to be

hooked up to the servos. The one-piece wing is removable, and Alfa Model includes water-slide decals for three versions. The kit also includes a removable, vacuum-formed cowl and a very detailed assembly manual that is among the best I have seen. It consists of an easy-to-read, four-page booklet and a detailed blueprint of the plane. To finish the Hayate,



The canopy hides the access hatch to the equipment bay. As you can see, there's plenty of space.



The elevators come hinged, and the control horn is installed for fast assembly.



The aileron pushrods are factory installed; you just have to hook up the aileron servo.

SPECIFICATIONS

MODEL: Nakajima Ki-84a Hayate
MANUFACTURER: Alfa Model
DISTRIBUTOR: Hobby Lobby Intl.
WINGSPAN: 33.75 in.
WING AREA: 186 sq. in.
LENGTH: 29.5 in.
WEIGHT: 15 oz.
WING LOADING: 11.6 oz./sq. ft.
MOTOR REQ'D: brushless Speed 300 size
RADIO REQ'D: 3-channel w/2 micro-servos (aileron, elevator, throttle)
FLIGHT DURATION: 12 to 15 min.
PRICE: \$119

COMMENTS

The Hayate is the perfect plane for intermediate pilots who are looking for an attractive, scale-looking warbird that is fast, stable and requires little build time.

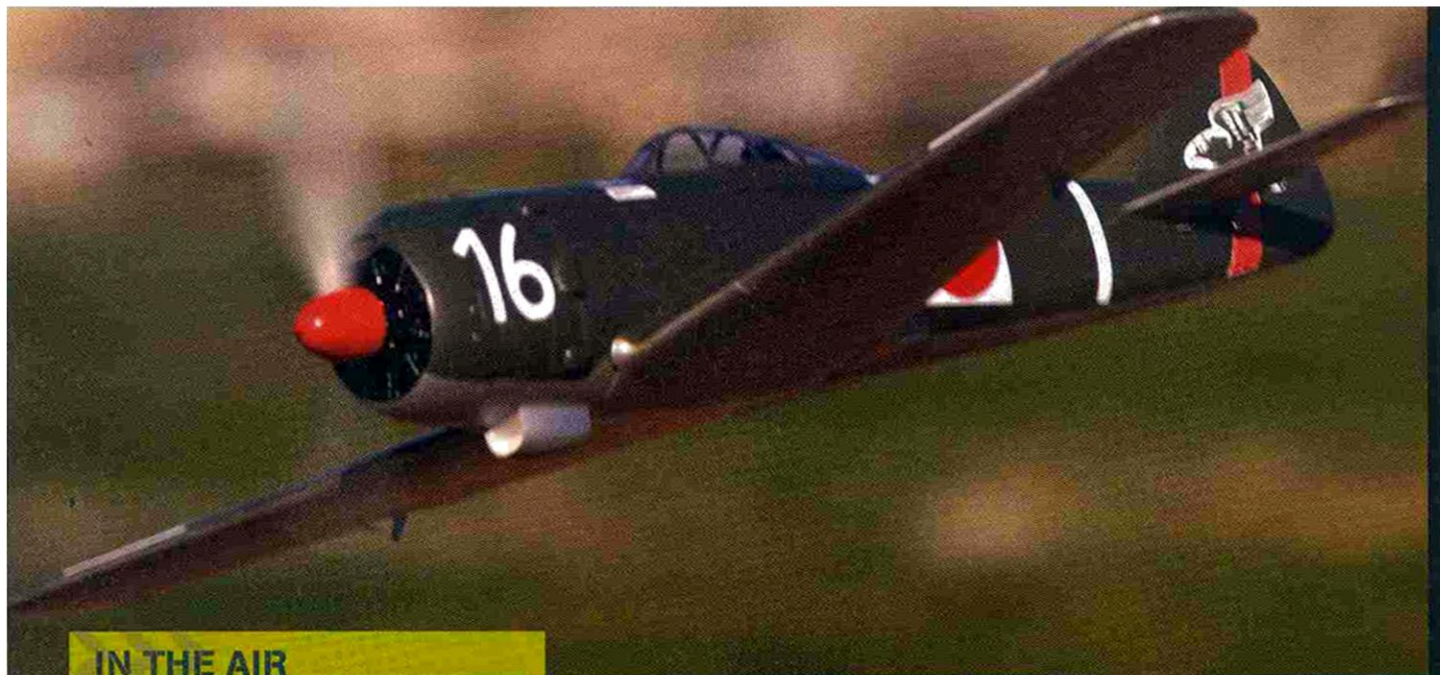
HIGHLIGHTS

- Unbeatable build quality
- Attractive design and scale appearance
- Fast assembly
- Spectacular performance

you need a 3-channel radio with two microservos, a 10A ESC, a brushless outrunner motor and the battery.

ASSEMBLY NOTES

Putting the Hayate together takes only about two hours. You need only install the motor, the two servos, the receiver and the ESC and place the battery in the fuselage to achieve the correct center of gravity (CG). The well-designed radio compartment hatch uses a flexible ply retainer that simplifies battery and equipment installation and removal. I started assembly by separating the major



IN THE AIR

With its low wing loading, high speed and scale appearance, the Hayate is a real blast to fly! The Hayate's vertical performance is almost unlimited with the recommended MP Jet power system. It can turn on a dime and give you a nickel back. Can you say "agility"?

CONTROL THROWS

Elevator: $\pm 3/8$ in. high/low
Aileron: $\pm 3/8$ in. high/low
Rudder: $\pm 3/8$ in. high/low

GENERAL FLIGHT CHARACTERISTICS

Stability: at lower speeds, the Hayate is a very docile, relaxing flyer; there's no need to worry about tip-stalls or poor flight characteristics.

Tracking: at high speeds, the Hayate performs like a pylon racer. It flies at speeds greater than 50mph and really carves through the air.

Unlike other scale aircraft, the model doesn't suffer from stalls or high-speed shakes.

Aerobatics: although this plane is not considered an aerobat, it does nice, smooth loops and has a better-than-average roll rate. The Hayate doesn't have a functional rudder, so knife-edge-type maneuvers are limited.

Glide performance: I expected the Hayate to be a handful when gliding in for landings, but that was not the case with this plane. On my first flight, I had to make multiple passes at the runway to prevent the plane from overshooting.

Equipped with the optional MP Jet power system, the Hayate's vertical performance is nearly unlimited, as its power-to-weight ratio exceeds the 1:1 marker.

assemblies and hardware. The model is not very large, so a small work area is suitable for this project.

RADIO INSTALLATION

Radio installation is very simple, thanks to the kit's well-thought-out engineering. The Hayate has plenty of room for the radio gear, and a pre-cut, lite-ply servo/battery tray

comes installed in the fuselage. I used Velcro® to mount the receiver and battery; it makes their installation and removal a snap. Screw the elevator servo into the servo tray, and then connect the pushrod to the servo. Make sure that the servo and elevator are centered before connecting them.

The aileron servo slips easily into its opening in the center of the wing, and I used low-temp hot glue to secure it. I then inserted the aileron pushrods into the provided plastic sleeve and attached it to the aileron servo.

POWER SYSTEM

I used the recommended brushless MP Jet AC 28/7-35D outrunner motor and a Jeti Advance 18A ESC—both available from Hobby Lobby. I really like this motor because it's smooth running and quiet. Its blue, six-spoke endbell adds to the appearance of a radial-type engine. An Apogee 3S 1570mAh Li-poly battery provided power. Before I installed the motor, I checked its alignment and then drilled three small pilot holes in the firewall. Using the wood screws

provided, I attached the motor. It fits very well and took only a few minutes to install. That completes the assembly of the Hayate. I told you it wouldn't take long!

FINISHING

All that's left is to balance the model, set the control throws and apply the waterslide decals. Applying the decals was the most time-consuming task, as they're very fragile. In the end, though, it took only about 20 minutes.

BOTTOM LINE

The Alfa Model Hayate is an excellent choice for pilots who prefer to spend their time flying rather than building. This well-made, semi-scale warbird is very impressive. It's super-easy to assemble and to get into the air, and it looks great! It isn't often that a manufacturer releases a model of an obscure aircraft that has been overlooked for so long. Now, where are those Mustangs and Thunderbolts? ✈

See the Source Guide on page 151 for manufacturers' contact information.

GEAR USED

RADIO: Hitec Focus 3 transmitter, Hitec 555 mini-receiver, 2 Hitec HS55 microservos, Jeti Advance 18A ESC

MOTOR: MP Jet 28/7-35D brushless outrunner

BATTERY: Apogee 3S (11.1V) 1570mAh Li-poly

PROPELLER: APC 9x6 Slow Flyer



SIGNAL CATCHING

Remote control requires two essential pieces of equipment: a hand-held transmitter that sends a signal and an airborne receiver that receives it. Receivers are tuned to identify and accept only their own transmitter's signal. At most busy flying fields, there will be many transmitter signals, but each is transmitted on a frequency that is determined by its crystal. If a receiver crystal is tuned to frequency channel 34, it will respond only to the signal that's sent on that frequency channel. Having accepted the signal, the receiver decodes it and converts it into electrical impulses that control the model's various servos.

Each servo is controlled by impulses that are on separate channels within the receiver (not to be confused with frequency channels). Radio systems can have two or more channels, also referred to as functions, in which to send electronic impulse signals to different servos; your choice will depend on your model's complexity. A radio for a full-house model has at least four channels. Additional channels are used to control such features as flaps, retractable landing gear and mixing. Mixing allows two channels to be used as one, for example, having the right aileron servo plugged into channel 2 and the left aileron servo plugged into channel 6. When the two channels are mixed, one stick input is transmitted to both channels 2 and 6, and the two servos work as one.

Extra receivers are a good investment because you can install them in different planes and control them from a single transmitter. There is no need to purchase a complete radio system for every new aircraft. A 4-channel receiver will work with an 8-channel transmitter and vice versa, but you won't be able to access four of the receiver/transmitter channels.

- **Cirrus**
MRX-6 Mk.II
Modulation: FM
Type: single conversion
Weight: 0.25 oz.
Size: 1.3x0.62x0.45 in.
Available frequency: 72MHz
Input power: 4.5 to 6V
Compatible with: all brands
Price: \$30.99

SUPER LIGHTWEIGHT



- **FMA Direct**
Quantum 6
Modulation: FM
Type: dual conversion
Weight: 0.5 oz.
Size: 2.12x0.8x0.58 in.
Available frequency: 72MHz
Input power: 4.5 to 6V
Compatible with: all brands
Price: \$89.99



- **GWS USA**
GWR-6N II
Modulation: FM
Type: single conversion
Weight: 0.28 oz.
Size: 1.18x0.79x0.37 in.
Available frequency: 72MHz
Input power: 4.5 to 6V
Compatible with: all brands
Price: \$24.50

PRICE BUSTER



- **Hitec**
Electron 6
Modulation: FM
Type: dual conversion
Weight: 0.6 oz.
Size: 1.47x0.98x0.62 in.
Available frequency: 72MHz
Input power: 4.5 to 6V
Compatible with: all brands
Price: \$59.99



- **JR**
R610UL (Ultra Lite)
Modulation: FM
Type: single conversion
Weight: 0.25 oz.
Size: 1.4x0.8x0.6 in.
Available frequency: 72MHz
Input power: 4.5 to 6V
Compatible with: JR, Multiplex, Airtronics
Price: \$64.99

SUPER LIGHTWEIGHT



- **Multiplex**
Pico 6
Modulation: FM
Type: single conversion
Weight: 0.63 oz.
Size: 1.7x0.6x0.6 in.
Available frequency: 72MHz
Input power: 4.5 to 6V
Compatible with: Multiplex, Airtronics, JR
Price: \$48.99



> Airtronics 92777

Modulation: FM
Type: dual conversion
Weight: 1 oz.
Size: 2.275x0.97x0.94 in.
Available frequency: 72MHz
Input power: 4.5 to 6V
Compatible with: Airtronics, JR, Multiplex
Price: \$71.99



> Futaba R127DF

Modulation: FM
Type: dual conversion
Weight: 1.5 oz.
Size: 1.4x2.5x0.8 in.
Available frequencies: 72/75MHz
Input power: 4.5 to 6V
Compatible with: Futaba, Hitec
Price: \$64.99



> Hitec HPD-07RH QPCM

Modulation: QPCM
Type: dual conversion
Weight: 1.27 oz.
Size: 2.1x1.4x0.9 in.
Available frequency: 72MHz
Input power: 4.5 to 6V
Compatible with: Hitec
Price: \$95



> JR R700

Modulation: FM
Type: single conversion
Weight: 0.61 oz.
Size: 1.82x0.94x0.52 in.
Available frequencies: 50 53 72MHz
Input power: 4.8 to 6V
Compatible with: JR, Multiplex, Airtronics
Price: \$79.95



> JR R770S

Modulation: FM
Type: single conversion
Weight: 0.61 oz.
Size: 1.82x0.94x0.52 in.
Available frequencies: 50 53 72MHz
Input power: 4.8 to 6V
Compatible with: JR, Multiplex, Airtronics
Price: \$99.95



> Multiplex Micro IPD

Modulation: FM
Type: single conversion
Weight: 1.1 oz.
Size: 2.1x1.1x0.6 in.
Available frequency: 72MHz
Input power: 4.5 to 6V
Compatible with: Multiplex, Airtronics, JR
Price: \$82.99



Installation Do's & Don'ts

WITH THESE FOOLPROOF RECEIVERS, very little can go wrong, but proper installation always ensures maximum performance. Here are some tips for proper receiver installation.

>DO properly secure the receiver inside the model. Foam padding or Velcro® will hold it in place and prevent shifting. Foam padding also helps to insulate the receiver from vibration.

>DON'T install the receiver too close to the engine, or it could be affected by electrical current. This is particularly important when operating a model with a gasoline-powered engine.

>DO check the polarity of the power lead before you plug it into a receiver.

>DON'T cut or coil the receiver antenna wire inside the model.

>DO range-check your model before you fly it, with and without the engine running.

>DON'T fly your model if the receiver experiences interference or servo glitches. Determine and eliminate the cause of the interference first.

>DO make sure that the servo leads are properly plugged into the receiver and that there isn't any tension on the leads that could cause them to come unplugged during flight.

>DON'T subject your receiver to excessive vibrations.

>DO balance your prop and make sure that the engine's output shaft isn't bent.

7-CHANNEL

> Sombra Labs Inc. Shadow 3

Modulation: FM
Type: dual conversion
Weight: 0.28 oz.
Size: 1.42x0.7x0.55 in.
Available frequency: 72MHz
Input power: 4.5 to 6V
Compatible with: all brands
Price: \$79.99

INNOVATIVE
TECHNOLOGY



8-CHANNEL

> Airtronics 92778

Modulation: FM
Type: dual conversion
Weight: 1.2 oz.
Size: 2.5x1.06x0.93 in.
Available frequency: 72MHz
Input power: 4.5 to 6V
Compatible with: Airtronics, JR, Multiplex
Price: \$79.99



> Airtronics 92085

Modulation: FM
Type: dual conversion
Weight: 1.53 oz.
Size: 2.5x1.5x0.8 in.
Available frequency: 72MHz
Input power: 4.5 to 6V
Compatible with: Airtronics, JR, Multiplex
Price: \$164.95



> Airtronics 92186Z

Modulation: PCM
Type: dual conversion
Weight: 1.53 oz.
Size: 2.5x1.5x0.8 in.
Available frequency: 72MHz
Input power: 4.5 to 6V
Compatible with: Airtronics, JR, Multiplex
Price: \$149.99



> FMA Direct Quantum 8

Modulation: FM
Type: dual conversion
Weight: 0.5 oz.
Size: 1.87x1x0.58 in.
Available frequencies: 50, 53, 72, 75MHz
Input power: 4.5 to 6V
Compatible with: all brands
Price: \$69.95



> Futaba R138DP

Modulation: PCM
Type: dual conversion
Weight: 1.5 oz.
Size: 1.4x2.5x0.8 in.
Available frequencies: 72/75MHz
Input power: 4.5 to 6V
Compatible with: Futaba, Hitec
Price: \$119.99



> Futaba R148DF

Modulation: FM
Type: dual conversion
Weight: 1.1 oz.
Size: 1x2.2x0.9 in.
Available frequencies: 50/72MHz
Input power: 4.5 to 6V
Compatible with: Futaba, Hitec
Price: \$119.99



> Futaba R148DP

Modulation: PCM
Type: dual conversion
Weight: 1.1 oz.
Size: 1x2.2x0.9 in.
Available frequencies: 50/72MHz
Input power: 4.5 to 6V
Compatible with: Futaba, Hitec
Price: \$149.99



> GWS USA GWRD-8

Modulation: FM
Type: single conversion
Weight: 0.81 oz.
Size: 1.75x1.25x0.76 in.
Available frequency: 72MHz
Input power: 4.5 to 6V
Compatible with: all brands
Price: \$28



PCM transmitters and receivers offer a **marked improvement in "noise reduction"** and provide safer performance in situations in which you're likely to encounter interference.

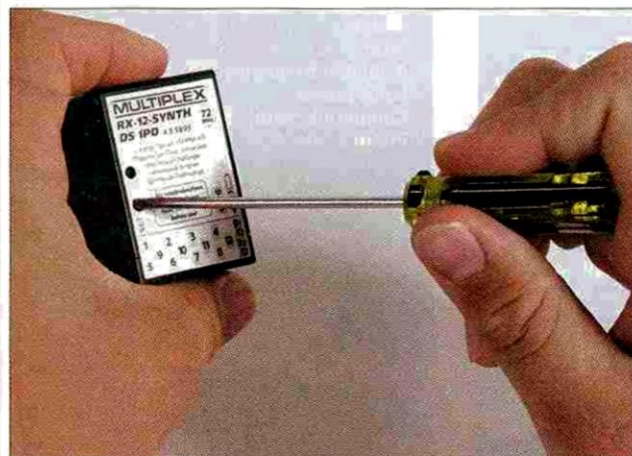
You can match differing brands of transmitters and receivers as long as they are both on the same frequency channel and both have the same type of signal phase shift—positive or negative. Futaba and Hitec FM transmitters and receivers are compatible because both brands use negative shift. JR, Airtronics and Multiplex radios are all compatible because they use positive shift. Certain high-end transmitters offer selectable shift modes that can transmit on negative

or positive shift, so they're compatible with all receivers. Some receivers also have selectable shift, and they're compatible with almost all FM transmitters. Several receivers now feature auto-shift detection and will automatically self-adjust to work with all brands of transmitter.

FREQUENCY CONTROL

Receivers may be single or dual conversion. This refers to the internal circuitry

that helps to reject unwanted signals. Either type of receiver will work with your transmitter as long as their crystals match; in other words, don't use a single-conversion crystal with a dual-conversion receiver and vice versa; they won't work. Most receiver crystals can be changed without your having to return the receiver to the manufacturer. Futaba suggests that high-band receivers (channels 36 to 60) and low-band receivers (channels 11 to 35) and crystals be changed only within



Pick a channel—any channel— with synthesized receivers

NEW BREEDS OF RECEIVERS AND TRANSMITTERS HAVE HIT THE MARKET. They don't require that a new crystal be installed to change the transmitting frequency. Synthesized receivers and transmitters offer the convenience of being able to use any frequency within the 72MHz band. This gives you the enviable ability to fly on any unused channel. Synthesized transmitter modules and receivers cost a little more but they're perfect for pilots who compete or fly at busy flying sites.

Most synthesized systems work by adjusting two tuning dials on the transmitter module and receiver. Remove the transmitter module from the transmitter, and select the desired frequency. The first dial represents the 10s column and the second dial the individual digits. Reinsert the transmitter module into the transmitter and set the receiver dials to match it. Do a quick range-check to confirm that everything is working appropriately, and fly on the open frequency.

Some synthesized systems, such as Multiplex, use internal software to adjust the frequency channel selection. Select the transmitter channel first: go to the transmitter's channel-setting menu and punch in the channel number you want to use. Turn off the transmitter, then turn it back on, and you're ready to program the receiver. Because the Multiplex receiver uses auto-shift, the channel-selection procedure will be the same for any transmitter. Turn on the transmitter and hold its antenna 2 to 4 feet from the receiver antenna. Press the set button on the receiver and, at the same time, turn the receiver on. Release the set button, and move any one transmitter control stick back and forth at least four times. Turn the receiver off and then back on, and the receiver will be tuned to the channel you selected. After a quick range-check, you are free to fly.

All synthesized receivers will work with nonsynthesized transmitters and vice versa, as long as they are on the same shift—positive with positive, negative with negative. The Multiplex receiver will work with all shifts. Synthesized receivers do not require any special care and can be treated just like any other receiver. Of course, you should check all radio equipment annually during the non-flying season. This is especially important with synthesized receivers to ensure that their dials and tuning functions operate properly.

If you hate waiting for your turn to fly, or you enjoy competing without having to worry about frequency conflicts, synthesized transmitters and receivers are the way to go.

Today's receivers are all but bulletproof, and their overall performance and durability are nothing short of amazing.

their specific bands (high or low). You should never swap the crystal in your transmitter, as this is illegal under FCC rules. Only its manufacturer should alter the crystal to ensure that the new frequency falls within the specifications for that channel. If the transmitter is equipped with a plug-in module, you can legally change it to a different frequency

because all the frequencies within that module have been fine-tuned.

Most full-house radios transmit on FM (frequency modulation) just like your car radio and portable music player. FM receivers are less susceptible to interference than older AM (amplitude modulation) receivers; more advanced radio transmitters, however, do work on a pulse-code

modulation (PCM) that uses digital coding to alter the signal and requires a PCM receiver.

PCM transmitters and receivers offer a marked improvement in "noise reduction" and provide safer performance in situations in which you're likely to encounter interference. The PCM transmitter takes the radio's FM signal and

8-CHANNEL

> Hitec Supreme Super-Slim

Modulation: FM
Type: dual conversion
Weight: 0.81 oz.
Size: 2.3x1.4x0.8 in.
Available frequency: 72MHz
Input power: 4.5 to 6V
Compatible with: all brands
Price: \$59.99



> Hitec Supreme RCD3500

Modulation: FM
Type: dual conversion
Weight: 1.34 oz.
Size: 2.3x1.4x0.8 in.
Available frequency: 72MHz
Input power: 4.5 to 6V
Compatible with: all brands
Price: \$54.95



> Hitec Supreme Shift Select RCD3800

Modulation: FM
Type: dual conversion
Weight: 1.34 oz.
Size: 2.3x1.4x0.8 in.
Available frequency: 72MHz
Input power: 4.5 to 6V
Compatible with: all brands
Price: \$47.99



9-CHANNEL

> Futaba R149DP

Modulation: PCM
Type: dual conversion
Weight: 1.2 oz.
Size: 1.3x2.2x0.8 in.
Available frequencies: 50/72MHz
Input power: 4.5 to 6V
Compatible with: Futaba, Hitec
Price: \$199.99



> JR R649S

Modulation: S-PCM
Type: single conversion
Weight: 1 oz.
Size: 1.42x 2x0.63 in.
Available frequencies: 50 53 72MHz
Input power: 4.8 to 6V
Compatible with: JR, Multiplex, Airtronics
Price: \$159.95



> Multiplex Mini DS-IPD

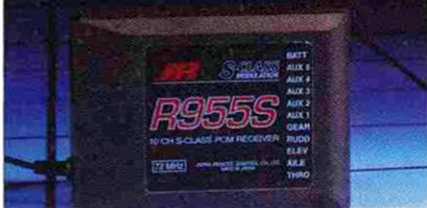
Modulation: FM
Type: dual conversion
Weight: 1.23 oz.
Size: 2.5x1.5x0.8 in.
Available frequency: 72MHz
Input power: 4.5 to 6V
Compatible with: Multiplex, Airtronics, JR
Price: \$92.99



10-CHANNEL

JR R955S

Modulation: S-PCM
Type: single conversion
Weight: 1.06 oz.
Size: 2.13x1.05x1.02 in.
Available frequencies: 50/53/72MHz
Input power: 4.8 to 6V
Compatible with: JR, Multiplex, Airtronics
Price: \$199.95



JR R945S

Modulation: S-PCM
Type: dual conversion
Weight: 1.06 oz.
Size: 2.13x1.5x1.02 in.
Available frequencies: 50/53/72MHz
Input power: 4.8 to 6V
Compatible with: JR, Multiplex, Airtronics
Price: \$209.95



programmed fail-safe position. For example, you could program the fail-safe to move the throttle servo to idle, move the aileron servos to neutral, move the elevator servo to slightly up and have the rudder servo move to make a gradual left turn. With this setup, the plane would (hopefully) make a gradual level circle as it slowly descends to the ground.

RECEIVER CARE

Signals are sent from a transmitter through a long, telescoping, collapsible antenna. The receiver antenna uses ordinary, plastic-coated wire to receive the signal. Do not alter this antenna's length in any way; doing so will affect the receiver's ability to catch the transmitted signal. Cutting or knotting the antenna will reduce the receiver's range. Coiling the antenna inside the model will also shorten its range. To maximize range, the antenna should be laid out straight inside or outside the fuselage before it is attached—generally, to the tail section. Don't let the antenna touch pushrods or servo wires.

Some receivers have only the same number of ports or slots for the servo plugs as they have channels. For example, an 8-channel receiver may have only eight ports. If you need more ports, you will have to Y-harness the flight battery with a servo into one of the ports. The battery can be plugged into the receiver through any of the available ports.

Your model's control surfaces may shake or jitter whenever the transmitter comes close to it, especially when the antenna is extended. This is commonly known as "swamping the receiver." Just move the transmitter at least 2 feet away and collapse the receiver's antenna; the shaking should stop. If it continues (especially while doing a range-check), you should not fly, and you should have your radio serviced.

Today's receivers are all but bulletproof, and their overall performance and durability are nothing short of amazing. By following the manufacturer's recommendations for radio-system installation and use, you and your model will benefit from a long and glitch-free relationship. Now, get out there and fly! ✈

See the Source Guide on page 151 for manufacturers' contact information.

12-CHANNEL

Multiplex RX 12 DS IPD

Modulation: FM
Type: dual conversion
Weight: 1.5 oz.
Size: 2.8x1.6x1 in.
Available frequencies: 72MHz
Input power: 4.5 to 6V
Compatible with: Multiplex, Airtronics, JR
Price: \$149.99



Multiplex RX 12 Synth. DS IPD

Modulation: FM
Type: synthesized dual conversion
Weight: 1.55 oz.
Size: 1.9x1.7x0.8 in.
Available frequency: 72MHz
Input power: 4.5 to 6V
Compatible with: all brands
Price: \$192.99



scrambles it into a code before transmitting it. The receiver then unscrambles the code to follow its commands. Random "noise" from other transmitters won't mistakenly be read as servo instructions, so there's less chance of interference caused by a mishap. Even if some noise does get through, it will not affect all of the servo channels because PCM does not transmit position signals for each servo in each pulse. Instead, it sends movement commands and occasional position-confirmation commands. If a

stray signal does get tangled up with the existing command string, it is not likely to affect all channels because there will never be a time when all the channels will have a command in one pulse.

PCM also incorporates fail-safe protection. If the receiver encounters interference, it will maintain the last known "clean" command. The receiver will maintain this signal for a set time that's programmed into the transmitter. If the interference lasts beyond the set time, the receiver will move the servos to the



PHOTO BY MATT BOYD

Coming out of a low-level rolling circle, a 46% Ultimate Biplane from Hangar 9 billows smoke.



ABCs OF THE ROLLING CIRCLE

TAKING IT
ONE STEP
AT A TIME

T

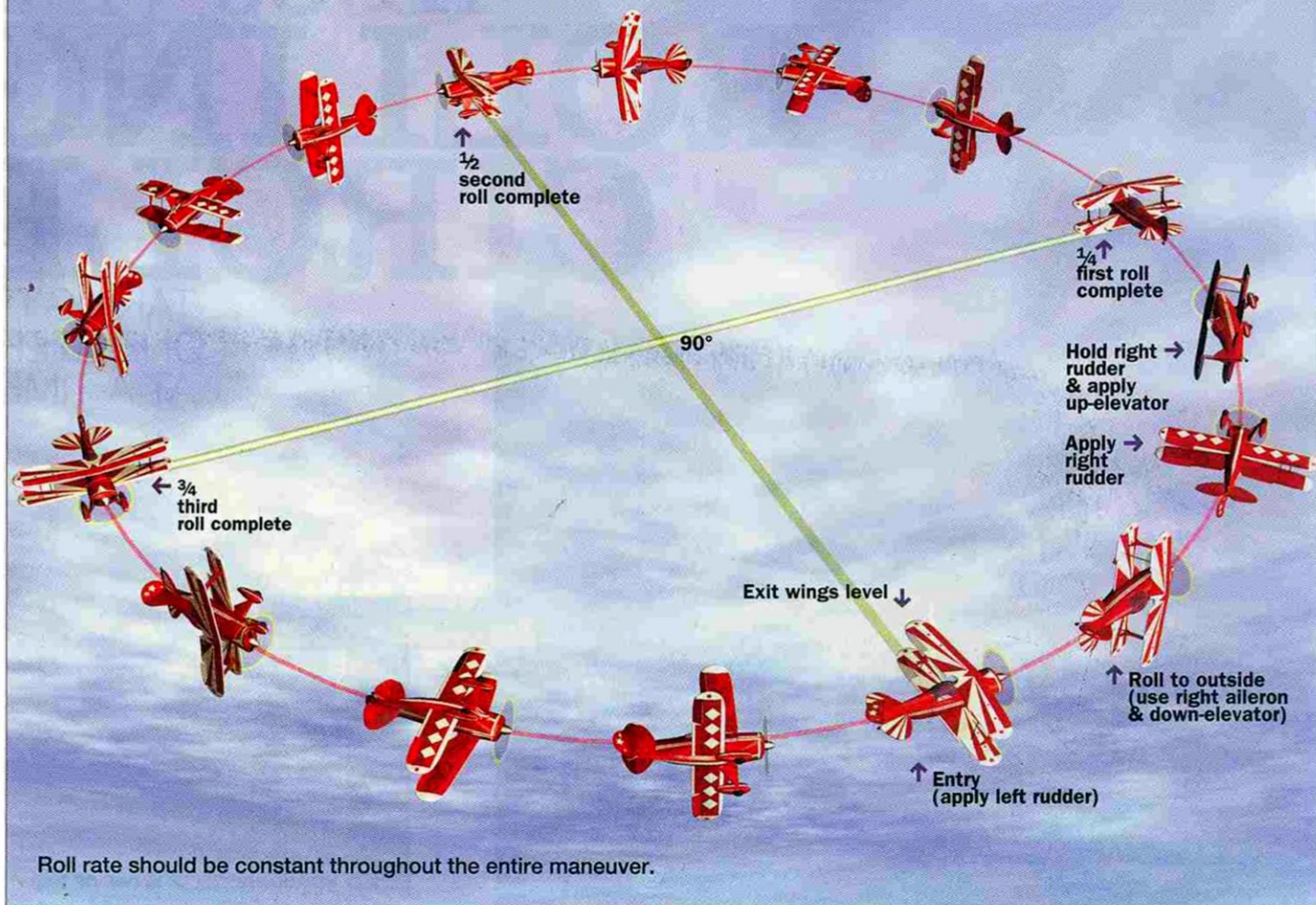
HE ROLLING CIRCLE IS ONE OF THE most crowd-pleasing maneuvers. Properly performed, it's quite a sight. To most of us, mastering this impressive maneuver just doesn't seem possible! It is, of course, extremely difficult to do successfully, but if you take it one step at a time, you'll be able to master it. For those who aspire to add the maneuver to their flight routine, I'll go through the basics and offer a few pointers.

THE BASIC MANEUVER

A rolling circle isn't a big, 360-degree horizontal turn with a lot of rolls thrown in; nor is it a continuous roll in which the pilot uses elevator to constantly change the heading. A true rolling circle is a continuous 360-degree turn with a specific number of rolls (usually one, two, three, or four). Because there are so few rolls, they are, in fact, slow rolls, and that's where the difficulty comes in. To perform a four-turn rolling circle, you must execute four rolls while maintaining a constant heading change, and every roll must be completed at every 90-degree quadrant of the circle. ➔

BY DAVE PATRICK
ILLUSTRATIONS BY FX MODELS

Figure 1. Four-roll, counterclockwise circle



THE PLANE

You'll need a highly aerobatic aircraft with a particularly effective rudder. Certain pattern ships will do, but many aren't designed to perform this kind of maneuver. The Conquest series, for example, would have a tough time, but the Finesse 1.20 would do the maneuver acceptably well. Scale aerobatic aircraft such as the Ultimate biplane, the Extra 300 and the Sukhoi fly the rolling circle really well. Many other good designs can do it as well, but I'm most familiar with these airplanes and am in a better position to comment on their flight characteristics.

How your plane responds to rudder input will determine whether it's a good candidate for a rolling circle. It should be able to sustain knife-edge, but being able to climb in knife-edge would be even better. There shouldn't be any pitch or roll coupling when the rudder is used in knife-edge; pitch and roll coupling make it much more difficult to fly the maneuver properly. Before attempting it, use your radio's mixing features to adjust your model's flight responses until there isn't any pitch or roll coupling.

BIT BY BIT

I'll assume that you're already pretty good at straight slow rolls. If you aren't, practice until you are. Because the rolling circle is so complex, don't try to do it all at once. As an example, let's fly the four-turn (rolling to the outside) from an upright entry, starting

from the left and flying to the right in a counterclockwise rolling circle (whew!). Got it?

Starting from your left, do four continuous slow rolls, using right aileron. There will be a 90-degree heading change for each completed slow roll. Focus on getting through the first slow roll while making a 90-degree heading change.

As you roll slowly to the right, apply left top rudder earlier than you would for a typical slow roll. Before the plane arrives at a knife-edge attitude, this top rudder will start the heading change and will help your plane to maintain altitude. Also, as you approach the knife-edge position, apply a little down-elevator to continue the heading change. Simultaneously, as your plane passes the knife-edge position, slowly remove the top rudder so that when the plane is inverted, all left rudder has gone; then apply right rudder. As you rotate past knife-edge, reduce down-elevator so that by the time the plane is inverted, you have only enough down-elevator to sustain inverted flight. Don't stop that down-elevator input too fast because it will also provide your plane's continued heading change.

Now, as you pass inverted, you must apply right rudder; this will continue the heading and maintain altitude. At the same time, start to apply up-elevator to provide a heading change again and to maintain altitude as you pass through the next knife-edge position. When the plane is upright again, you have completed the first slow roll and the first 90-degree heading change. This is easier said than

roll and the first 90-degree heading change. This is easier said than done, especially when you're constantly mixing the control input proportions as you roll and change heading.

Now practice this first part of the circle until you feel comfortable and can execute the moves consistently well.

After you've mastered the first roll (this may take quite a few flights), do two rolls, and so on. You'll quickly find that the most difficult part is the last roll. That last quadrant (see Figure 1) presents you with a very unusual situation: you're trying to do a slow roll with your plane coming towards you. I can offer you no help here other than to tell you to practice at a comfortable altitude. If you build your rolling-circle skills bit by bit, you'll become proficient enough to work out the last roll.

I've focused on a particular version of the rolling circle; here are a couple of variations: how about a four-turn roll, but alternate the direction of rotation and start from inverted? Or try a two-roll rolling circle or a single roll (see Figure 2).

TIPS

➤ Most people use full power during a rolling circle, but a few pilots have discovered that by using a lower power setting, they can do a maneuver that isn't quite as large, and they have more time to think. If you can set up your radio so that the flip of a switch will

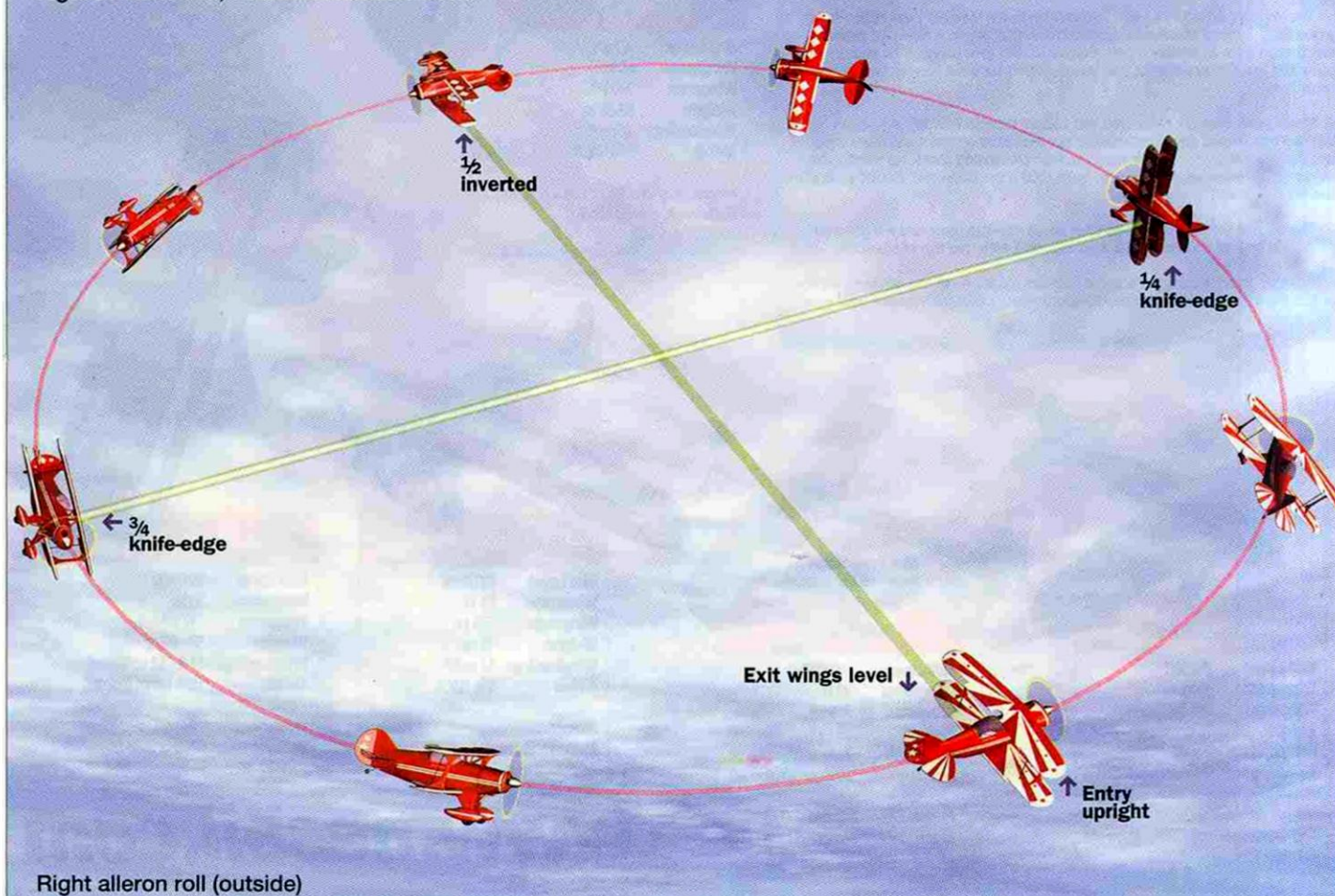
reduce throttle to 70-percent power, it may be helpful. The Futaba 9ZAP has a feature that lets you change control inputs to suit flight conditions; it's particularly good for this kind of maneuver because you can put in an adjustable time delay.

➤ If your first roll is to the inside, i.e., from left to right, rolling left, in a counterclockwise circle, don't apply left rudder to yaw into the turn. It may seem correct, but it isn't necessary. It's easier just to roll left, add up-elevator to provide the heading change and then rudder to maintain altitude.

➤ If you're attempting a rolling circle and you alternate the direction of the rolls, rudder-application direction can be confusing. A simple trick is to use the last rudder input to start the next roll. Think about it; it works. In fact, I don't take all the rudder out; I leave just a little in at the end of each roll so that there isn't any question about which rudder to apply.

So, there you have it. Learning to fly a well-executed rolling circle is achieved by using your rudder and elevator control constantly with precise timing and rates of deflection. It will take a lot of practice and forethought to figure out how to keep improving your flying skills. So go out and fly, fly, fly! I hope this article will encourage

Figure 2. One-roll, counterclockwise circle



PHOTOS BY MARK RITTINGER, CHRISTINA ESCALANTE & JHONNY ESCALANTE



Messerschmitt BF 109E

An electric Luftwaffe fighter with options



CERTAINLY ONE OF THE MOST RECOGNIZABLE WW II GERMAN aircraft—the Bf 109 fighter—was also one of the deadliest in the hands of experienced Luftwaffe pilots. Erich Hartmann's 352 kills, Gunther Rall's 275 and Adolf Galland's 103 kills are all testament to the ferocity of the Bf 109 in combat. More than 33,000 were built, though few remain airworthy today. The plans include all the templates to make four versions of the plane: the Bf 109E, the Bf 109K, the Czechoslovakian-built Avia S199 and the Spanish-built Hispano Ha 1112. ★ My model is roughly 1/8 scale and has a 100-percent-scale outline, including the stabilizer and elevator. It flies wonderfully just as Willy Messerschmitt designed it, and I have found no need to enlarge the stab. The model is one piece and does not have a removable wing. The prototype uses an inexpensive Kyosho Magnetic Mayhem reverse-wind motor, a Master Airscrew 3.5:1 gearbox, an APC 12x10



This is the basic fuselage framework. The side doublers have been glued into place.



The completed airframe with hatch cover in place.



With the aft sheeting wrapped over the aft turtle deck and the firewall glued into place, basic fuselage construction is now complete.

prop and an Apogee 3S1P 2480mAh Li-poly pack from Prop-shop.com. This setup produces 59 ounces of static thrust, and with a total flying weight of only 38 ounces, it performs really well.

THE FUSELAGE

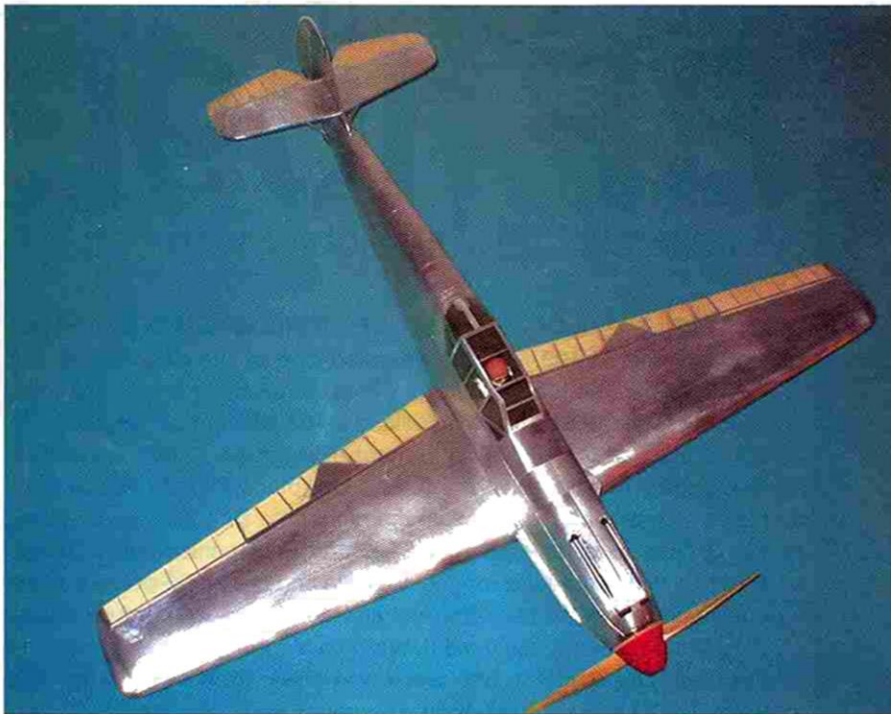
Cut out all the appropriate formers for the version you want to build. Some are laminated from two layers of $\frac{1}{16}$ -inch balsa for light weight and strength. Make the two doublers out of $\frac{1}{32}$ -inch balsa and the sides out of $\frac{3}{32}$ -inch "A-grain" balsa. Pin formers F3 and F4 to the building board upright, and glue the upper stringers and gussets into place. To ensure a straight fuselage, leave it pinned on the board until all the sheeting has been applied. Glue F2 into place with

about 2 or 3 degrees downthrust built in, and then secure it with gussets. Place F5 and F6, and glue the tail ends together.

Install the lower stringers, then prop the tail up to the correct height and install the top spine. This will make a strong, light framework to attach the sheeting to. Carefully line up the $\frac{1}{32}$ -inch balsa doublers and glue them to the frame, curving them under the nose. Add the $\frac{1}{4}$ -inch-wide fairing strips to the stringers as shown. Now you can add the $\frac{3}{32}$ -inch sides. This requires some care but is not very difficult. I suggest using aliphatic glue so you can take your time getting it aligned correctly. Spread glue on the doubler and line up the fuselage side so the top hatch line and doubler match, then pin the side to the frame as shown in the photo. After the glue has set, use CA to glue the side to the top stringer and then to the bottom stringer. Wet the outside of the turtle deck, bend it over, mark it, and cut it to length. Do the same for the opposite side before gluing. While the sides are still wet, glue one side at a time to the top spine.



I applied the foil tape in small panel sections and burnished them into place.



Almost too pretty to paint! The Messerschmitt fighter awaits a coat of paint!



This close-up of the tail surfaces shows how I duplicated the framework with aluminum foil tape. Clear Doculam plastic covers the tape before painting.

ADDITIONAL SPECIFICATIONS

MODEL: Messerschmitt Bf 109E

TYPE: 1/9-scale, electric WW II Luftwaffe fighter

WINGSPAN: 42 in.

WING AREA: 260 sq. in.

WEIGHT: 38 oz.

WING LOADING: 21 oz./sq. ft.

LENGTH: 37 1/8 in.

RADIO REQ'D: 3-channel (aileron, throttle, elevator)

MOTOR USED: Kyosho Magnetic Mayhem Reverse-wind

GEARBOX USED: Master Airscrew 3.5:1

PROP USED: APC 12x10

BATTERY USED: Apogee 3S1P 2480mAh Li-poly

After the glue has dried, remove the fuselage from the board and install the lower and front blocks and former F1.

Install the tailwheel wire in the ply mount plate and glue it in place between the lower stringers. Fit the rear fin blocks to the top of the fuselage, leaving an 1/8-inch gap between them for the fin. Now you can add the lower rear pink foam block and sand it to shape.

THE HATCH

The hatch is built on top of the completed fuselage. The floor is 1/16-inch balsa, and the front of the hatch is carved out of pink foam or a light balsa block. To hold it in place, I used a music-wire alignment pin in front and rare earth magnets in the rear. I made the canopy frame from thin plywood strips

covered with clear, 0.020-inch acetate. I used a Hangar 9 1/9-scale latex pilot bust.

THE WING

You can build the wing with balsa ribs and spars, or you can cut pink foam wing-cores. I have included rib templates and a wing plan for those unable to cut foam. The airfoil I use is very close to a Ritz 3-30-13. It provides excellent penetration, a subtle stall and very nice overall behavior.

If you use foam-cores, cut them with 1/8-inch washout at the tips. Sand them lightly and cut out the openings for the servos, the servo wire channels and the hand-hold wells. I installed the Y-harness and extension leads before attaching the 1/32-inch wing sheeting. Use a contact cement such as Southern Sorghum from Dave Brown Products. If you use a more powerful brushless motor, sheet the wing with 1/16-inch balsa or 1/32-inch sheeting with carbon-fiber reinforcement.

Glue the two panels together, and wrap the joint with nylon tape and epoxy. Cut out the servo holes and hand-holds, and line them with 1/16-inch balsa. Cut out the ailerons, face them with 1/8-inch balsa, and bevel the leading edges. Cap the aileron area with 1/16-inch balsa. Glue the wingtips on and then make the radiator scoops; I used basswood for durability.

The built-up-wood wing is assembled in halves over the plans and uses 3/32-inch medium balsa ribs, 1/32-inch wing sheeting, an 1/8-inch-ply wing joiner and 1/16-inch vertical-grain balsa shear webs glued to the spars. The ribs have building tabs to keep them in proper alignment; these have to be removed before you add the bottom sheeting.

Once the wing is completed, use it as a

guide and sand the saddle to get a tight fuselage-to-wing fit. I left a small gap open at the trailing edge to let air out, rather than cut a cooling hole in the fuselage.

TAIL SURFACES

The tail surfaces are all made out of 1/8-inch sheet balsa. Cut the fin first and trial-fit it into the fuselage. Make the horizontal stabilizer, slide it into the fin, and epoxy it in place square to the fin. Assemble the elevator halves, bend the wire joiner to shape and glue it into place. Set the wing and the tail assembly on the fuselage and adjust them for 0-degree incidence. There should be no incidence in the wing or the stab.

MOTOR AND RADIO INSTALLATION

I used a Hitec radio to control the ailerons, elevator and throttle. Attach the motor after break-in, then install the gearbox. Be sure to install all three motor capacitors! I used servo tape to install all the servos. I smear epoxy or CA on the areas where the servos go so the tape will hold securely. I used a Castle Creations Pegasus 3SP Brushed ESC, and I installed the Apogee Li-poly pack directly above the motor and as far forward as possible. Place the receiver as far away from the motor as possible, and be sure to program your ESC for the proper voltage cutoff if you are using Li-poly cells. Set control throws as indicated on the plans, then do a range check with the motor running.

COVER AND FINISHING

The covering choice is up to you. I used Harbor Freight Aluminum foil tape as the covering so I could try a nice weathered finish. Cover the foam sections with 0.75-ounce fiberglass cloth and epoxy resin, and sand them smooth. Give the fuselage two



The spinner is homemade with a wooden backplate and a dome made of pink foam. The cowl is nicely detailed.



The main hatch goes from just aft of the spinner back to the aft edge of the canopy! Easy access for everything.

coats of dope sealer, and sand it smooth. I then added the aluminum foil by using electrical tape to outline the panel areas. I applied each piece of foil individually, trimmed the excess away and removed the electrical tape before moving to the next section. Work from the rear to the front so the tape overlaps in a scale fashion. Burnish the tape down with an artist's "Smudge-Stick," and it won't come off. Because the wing has a foam-core, I was reluctant to use dope for fear of melting the foam, so I applied the tape directly to the bare wood. I duplicated all the surfaces of the full-size Messerschmitt that were fabric-covered with light clear Doculam plastic instead of foil. On the rudder, elevator and ailerons, I made the "framework" with foil and then applied the thin plastic to cover them. This technique produces a very convincing look.

For my color scheme, I used Perfect Paints spray cans. The paint has a rather tough grip on the foil once it dries, so weathering should be done before it completely dries. I used Testors bright yellow for the nose. I hand-painted all the markings and used an X-Acto blade to "chip" the paint. Weathering was done with rough steel wool. I used old floppy disc material for the hinges, and all the rivet detail was pressed on with a dressmaker's wheel. I made the spinner with a basswood backplate and shaped the pink foam for the cone.

FLYING

Balance the Bf 109 as shown on the plans, then check all control surfaces for correct direction and travel. The model must be hand-launched, so start with a few clicks of up-trim. Line up straight into the wind and launch the model with wings level and slightly nose-high at full power. With such a large prop, the 109 will climb very well from an overhead throw. Gain some altitude, then trim it out.

At full power, the Messerschmitt will really move. It looks convincing during low-level, high-speed passes. It retains energy well, as the airframe is quite clean. Throttled back, low-speed flight is quite a surprise. Even I expected the scale-size tail to be a problem, but it wasn't. The 109 just plods along gently at $\frac{1}{3}$ power and retains control right up to the stall. If you like aerobatics, this one will do nice axial rolls, large loops and a fantastic split-S. It has no wobble and pulls through maneuvers like a small pattern ship.

For landings, always keep the nose into the wind. Hold a little power on, line up on the runway, and guide it in at about $\frac{1}{4}$ throttle. Just before touchdown, cut power and flare just as you touch the grass.

CONCLUSION

Whichever version of the 109 you build, I hope you enjoy it as much as I did. It is a fine flying bird and one that will draw a lot

COMMENTS

Besides showing the E-model, the plans also detail the parts and outlines for three other 109 models: the Bf 109K, the Avia S199 and the Hispano Ha 1112.

FEATURES

Designed by Mark Rittinger, the Bf 109E is a one-piece electric-powered scale fighter that has a 100% scale outline. The model uses traditional balsa, liteply and foam-wing-core construction and is relatively easy to build. The plans also show built-up-wood wing construction.

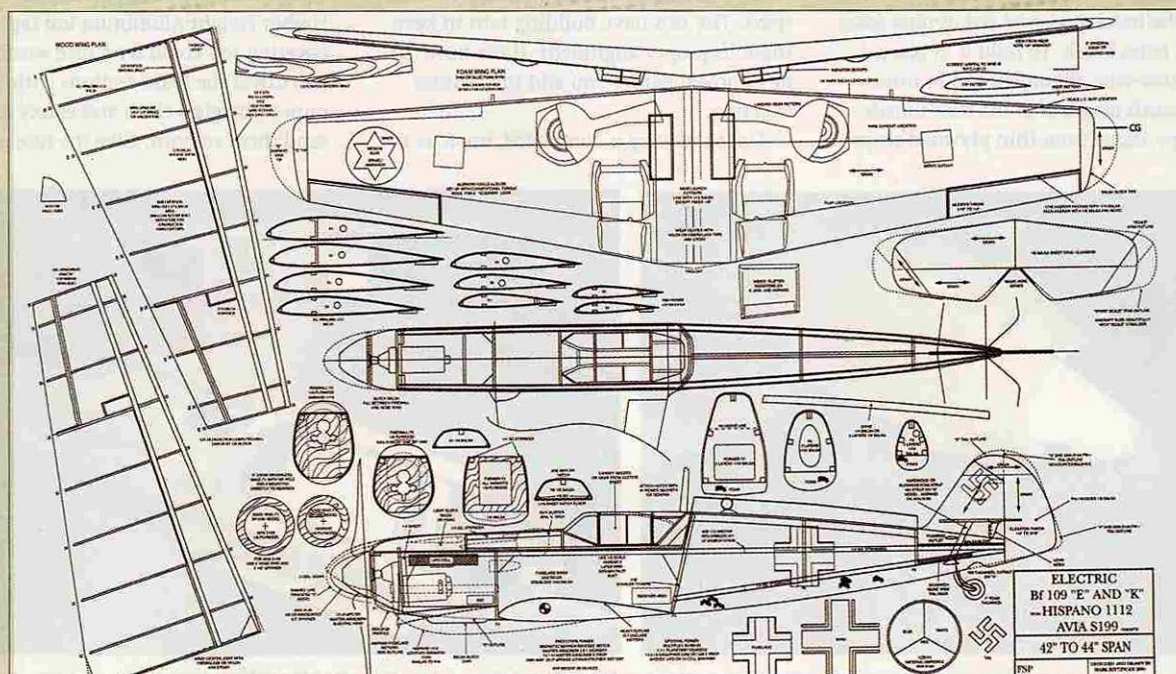
of looks at the field. Not much can compare with long, low passes across the field with a snarling and sinister Messerschmitt! If you need any help, please feel free to contact me at mrittinger70@hotmail.com. Good luck, and watch your six! ✈

See the Source Guide on page 151 for manufacturers' contact information.



FOR MORE
PHOTOS &
DETAILED INFO

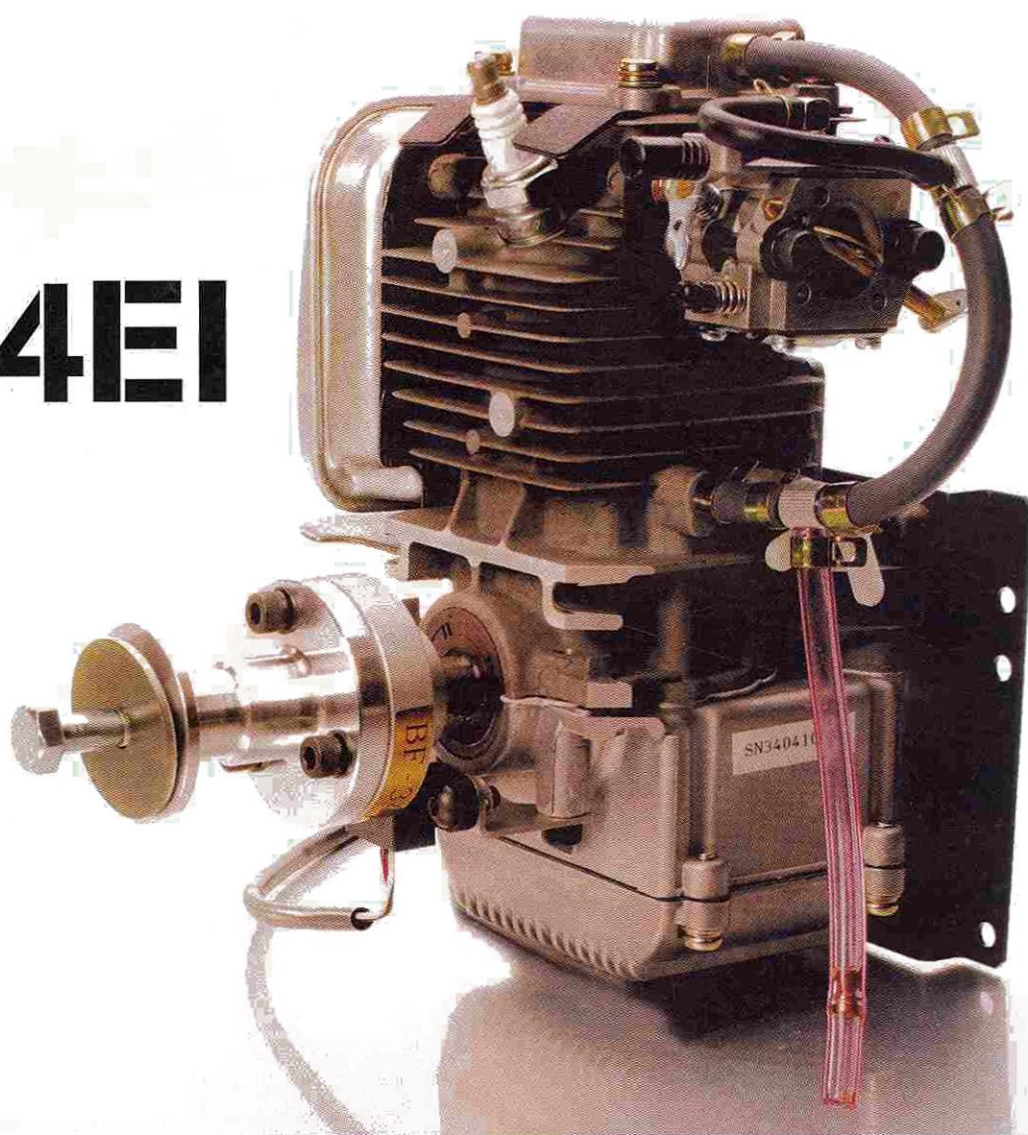
FSP 0605A MESSERSCHMITT BF 109E



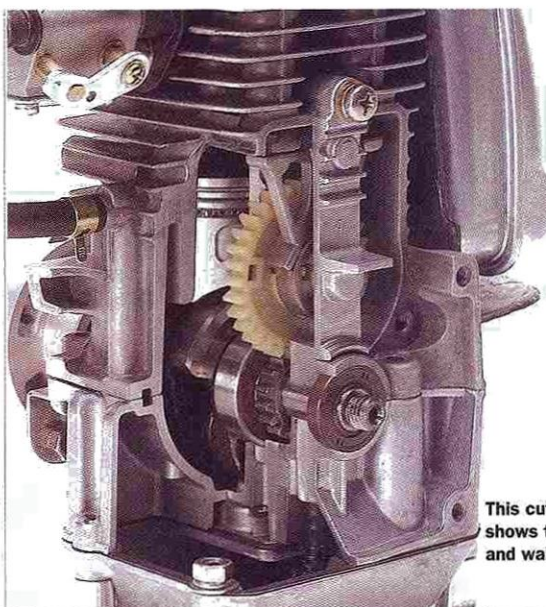
TO ORDER THE FULL-SIZE PLAN, VISIT RCSTORE.COM ONLINE.

FUJI BF34EI

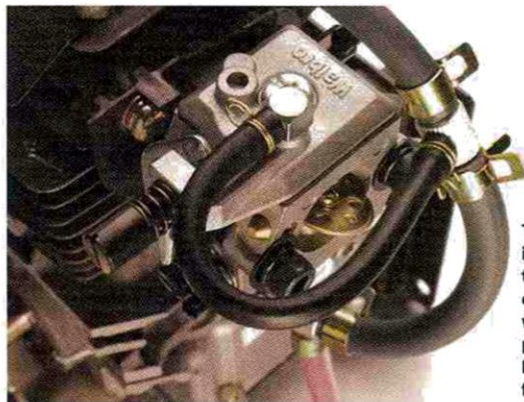
4-stroke power
for gasoline!



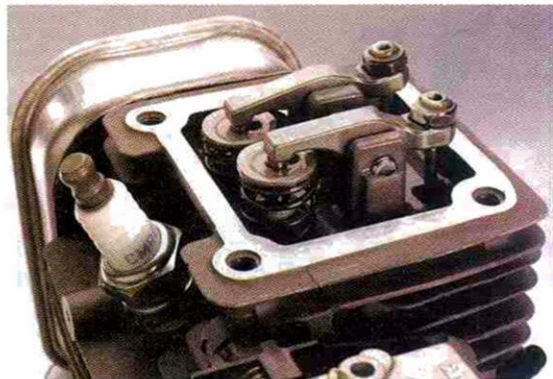
WHEN MODELERS GET TOGETHER TO TALK ABOUT engines, two types of engine seem to dominate the conversation. Four-strokes and gasoline engines are ever popular and have earned solid reputations for performance and reliability. Just imagine the possibilities if we could combine the two! Well, you need not simply imagine it any more. Distributed by Great Planes, the new Fuji BF34EI is a well-engineered, user-friendly 4-stroke powerplant that burns gasoline and is poised to become the next hot ticket with the giant-scale gang.



This cutaway display engine shows the internal cam drive gear and walking-beam cam lifters.



The big-bore Walbro carb is attached to the side of the cylinder opposite the exhaust port. It is driven with crankcase pulse pressure through a pressure line that's attached to the fitting on the top cover.



Removing the rocker cover reveals a stout valve-drive assembly driven by an internal cam.

SPECIFICATIONS

Engine: BF34EI 34cc
Type: 4-stroke
Displacement: 2ci (33.5cc)
Bore: 39mm
Stroke: 28mm
Rpm range: 1,400 to 9,000
Horsepower: 2 @ 7,000rpm
Torque: 1.45 ft.-lb. @ 5,000
Weight: 4.9 lb.
Price: \$939.99

ENGINE HIGHLIGHTS

- Excellent overall quality
- Steady idle
- Very easy to start
- Smooth throttle transition
- Extremely quiet

FEATURES

Walbro carburetor, electronic ignition system, Champion RCJ6Y spark plug and wrench, muffler and mounting hardware, prop flange, washer and attachment bolt, 3.4-ounce (100cc) bottle of Fuji OW20 100-percent-synthetic engine oil.

REQUIRES

Regular unleaded gasoline, engine oil, prop, engine kill switch, 4.8V Ni-Cd or NiMH battery pack.

BIG-BLOCK 4-STROKE

As far as I know, this is the first of its kind: a designed-for-RC, 4-stroke gasoline engine that's ready to be bolted to the firewall. Being a true 4-stroke, the BF34EI has an internal intake and exhaust valve train and a wet-sump oil lubrication system in the bottom of the crankcase. The engine runs on straight gasoline; you don't mix the oil with the fuel! It has an O-ring-sealed dipstick on the side of the crankcase for checking the oil level. The engine is equipped with an electronic ignition system; you supply the 4.8V battery and switch harness. The engine has an efficient muffler and, combined with the lower 4-stroke exhaust cadence, the Fuji 4-stroke is extremely quiet.

THE INTERNALS

The engine case is a three-piece affair with an upper cylinder casting, a main crankcase and the lower oil sump, or belly pan. The crankshaft ball-bearing support webs are split horizontally with the top half in the cylinder casting and the bottom half as part of the crankcase. Four M5 socket-head bolts in the crankcase thread into the bottom of the cylinder casting to hold the cylinder and crankcase castings together.

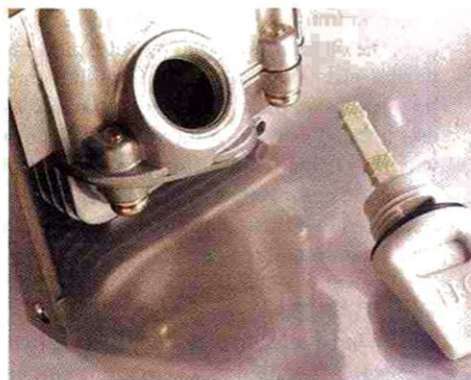
Supporting the crankshaft are two front ball bearings, a rear ball bearing just aft of the crankshaft web and a smaller sealed ball bearing at the end of the shaft where it exits the engine case. Between the two aft ball bearings, a metal gear is attached to the crankshaft. This gear drives the composite cam gear that's in the back of the cylinder casting in the cam gear compartment. A rear cover and a gasket seal the compartment. The cam gear and a single valve cam ride on a short cam gear shaft. Two walking-beam cam lifters on either side of the cam pivot on a common shaft positioned just above the cam gear. The cam lifters transfer the cam's motion to the pushrods that drive the

rocker arms and valves. At the top of the cylinder casting, the valves, springs, rocker arms and adjuster screws are all housed beneath a cast-metal rocker cover.

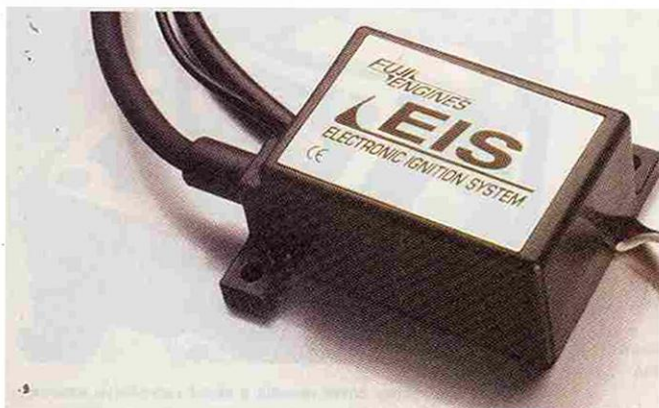
The flat-topped piston has three piston rings; the lowest ring does double duty as the main oil seal. A stout conrod connects the piston to the crankshaft. Needle bearings support the upper and lower ends, and a hollow wristpin captures the conrod within



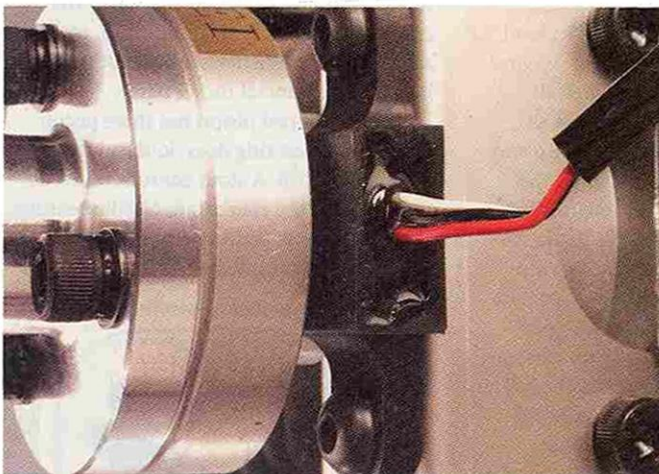
The supplied muffler is compact and very effective at keeping the engine's noise levels down. There is almost no exhaust residue at all!



The Fuji 4-stroke is equipped with an O-ring-sealed dipstick to check its oil level.



The electronic-ignition module comes with the engine.



The electronic ignition is triggered by a magnet in the flywheel as it passes this Hall-effect sensor.

the piston skirt. Two C-clips keep the wristpin in place.

As is usual with Fuji gasoline engines, the BF34EI's Walbro pumper carb is mounted on the side of the cylinder casting (opposite the exhaust port) and is driven by a pressure line connected to a fitting in the side of the engine case. This line feeds pulse pressure to the carb and the rocker cover by means of a T-fitting. A second T-fitting (containing a check valve) is attached to the lower end of the pressure line to help dump small amounts of excess oil out of the system as the engine runs.

The oil pump is really the heart of this 4-stroke, and it's attached to the bottom of the crankcase within the wet sump. Like the Walbro carb, the oil pump is driven by pulse pressure and a diaphragm. A flexible pick-up tube draws oil from the sump, and the pump delivers it to various oil passages in the engine case. The lubrication system uses ultralight 0W20 synthetic oil, and a bottle of this oil is included with the engine. The only drawback to this design is that the engine cannot be run inverted, as the pick-up tube would be starved of oil. I have been told that an inverted engine design is in the works, so hold on for more to come.

FIRE STARTER

The Champion RCJ6Y resistor spark plug (0.024-inch gap recommended) is energized by an electronic-ignition module that's supplied with the engine. The module comes wired with the high-voltage spark-plug wire and cap, a ground wire, the battery power



FUJI IN THE AIR

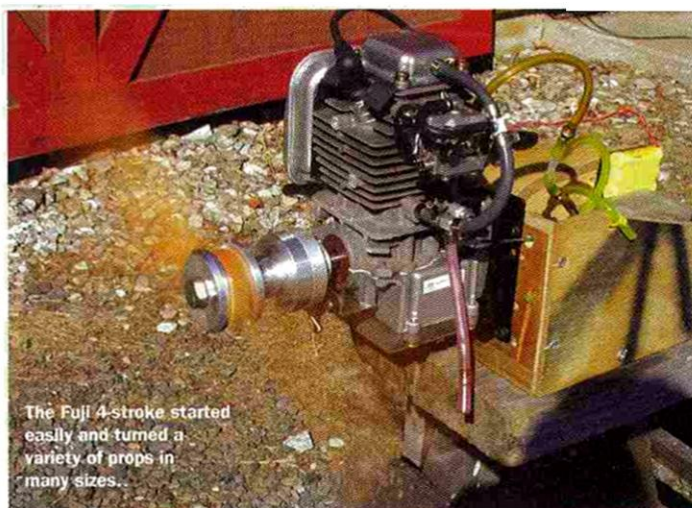
ABOUT A YEAR AGO, DON ANDERSON, PRESIDENT OF GREAT PLANES, showed me the Fuji 4-stroke gas engine. He explained that the engine had to be mounted upright because there was oil in its crankcase.

As a factory demo pilot, all I could think about was which airplane this engine would fit to make the best impression. With the way the engine sounded and its low-end torque, I thought it would be awesome inside a big, WW I fighter. It has been quite a while since something new in the RC world got me this excited! The Balsa USA 1/4-scale Fokker D.VII has an 88-inch span, and the Fuji 34cc engine fits perfectly; it's nicely concealed beneath the dummy engine I built for the D.VII. The engine sounds exactly as it should for a WW I biplane, and it swings huge props!

This unique engine needs to be handled similarly to a full-size aircraft engine. There are three main differences between it and all others, and they're all positive: low heat, perfect sound and high torque. It does need to warm up a bit before flight to get the oil temperature up. A cold engine won't transition well, so you can't just start up and go fly. The warm-up period gives you time to check the controls and settle your mind before you taxi to the end of the runway. Also, with internal oil to help dissipate heat, the engine runs very cool compared with any other engine you've ever run. The low operating temperature allows the engine's inherent torque to be put to good use. Using a very large prop usually means that sooner or later, the engine will overheat, lose power and then quit. Unlike 2-stroke engines, the Fuji 4-stroke produces good power between 2,500 and 4,000rpm—perfect for swinging propellers up to two sizes larger than what would be used for the displacement. For example, a 34cc 2-stroke would comfortably swing an 18x10 prop, whereas a Fuji 4-stroke of the same displacement easily turns a 22x10 and still maintains a good operating temperature. The larger, slower-turning prop also cuts down on noise, so you can hear the sweet "putter-putter" of the engine.

This engine sounds so true to scale that it's difficult to believe. It's a combination of the internal valve train and the low rpm required to fly. Two-stroke gas engines never sound "right" because their rpm are too high. Full-scale aircraft engines rarely turn more than 3,000rpm at takeoff, and they cruise at 2,000 to 2,400rpm; our "normal" model engines cruise at around 7,000 to 9,000rpm.

It has been fun working with the new Fuji engines. Fuji is working on a modified version that will run inverted, and I'm eager to see what else Fuji will come up with for the model gas-engine market. —Greg Hahn



The Fuji 4-stroke started easily and turned a variety of props in many sizes.

PROP PERFORMANCE

Brand	Size	Rpm
Top Flite PowerPoint	22x6-10	5,500
	20x8	5,700
	20x6-10	5,900
	18x10	6,200
	18x8	6,400
Zinger	20x10	5,400
	20x8	5,650
	18x10	6,000
Clark Industries	24x6	5,450

lead and the timing pick-up lead with a white plastic connector. A small magnet embedded in the side of the flywheel activates the Hall sensor to fire the ignition system. According to the instructions, a 4.8V, 850mAh NiMH battery pack will drive the ignition system for approximately 3½ hours. You have to supply your own power switch to kill the engine.

ENGINE OPERATION

Before running the engine, mount it upright on the firewall, and fill the sump with the provided oil. The engine has an oil capacity of approximately 100mL. Fill the sump until the oil level falls between the upper and lower hash marks on the dipstick. I filled it with approximately 85mL. Attach the electronic-ignition system and drive battery and hook up the throttle linkage to the 90-degree throttle bellcrank. Two small Hirobo helicopter-style ball links and a short threaded rod complete the linkage setup. Hook up the fuel system, and be sure to use a gasoline-proof tank stopper and fuel lines. Install a large-volume fuel filter intended for gasoline, and then fill the tank.



The supplied hardware includes the prop-hub assembly, a hex wrench, a spark-plug tool and ball links for the throttle linkage.

“For giant-scale airplanes that need to turn big props, the Fuji BF34EI engine is a perfect match.”

STARTING THE ENGINE

The manual indicates that the engine has been run and doesn't require break-in. I found that it took a long time to draw the fuel through the fuel lines by hand-flipping the prop, so I used my Sullivan Dynatron electric starter. Once the fuel has reached the carb, close the choke and turn on the ignition. Open the throttle fully, and flip the prop sharply or crank the engine with your starter. The engine must be turning over at 500rpm for the ignition system to fire. Once the engine coughs, set the throttle a few clicks above idle, open the choke and flip the prop again. My test engine never failed to start on the first or second flip!

Allow the engine to warm up for a couple of minutes before you advance the throttle. My initial carb settings were 1¾ turns out from fully closed for the high-end needle valve and 1½ turns out for the

low-end needle. With very little adjustment (perhaps ¼ turn rich for the high end and ¼ turn lean for the low end), the engine performed beautifully. You can let this baby idle for half an hour or more; then, if you quickly advance the throttle, there isn't a bit of hesitation or burble. The top end is solid and strong, and the engine definitely likes to turn the big hunks of wood! (See the "Prop performance" chart above for the engine-test readings.)

PARTING THOUGHTS

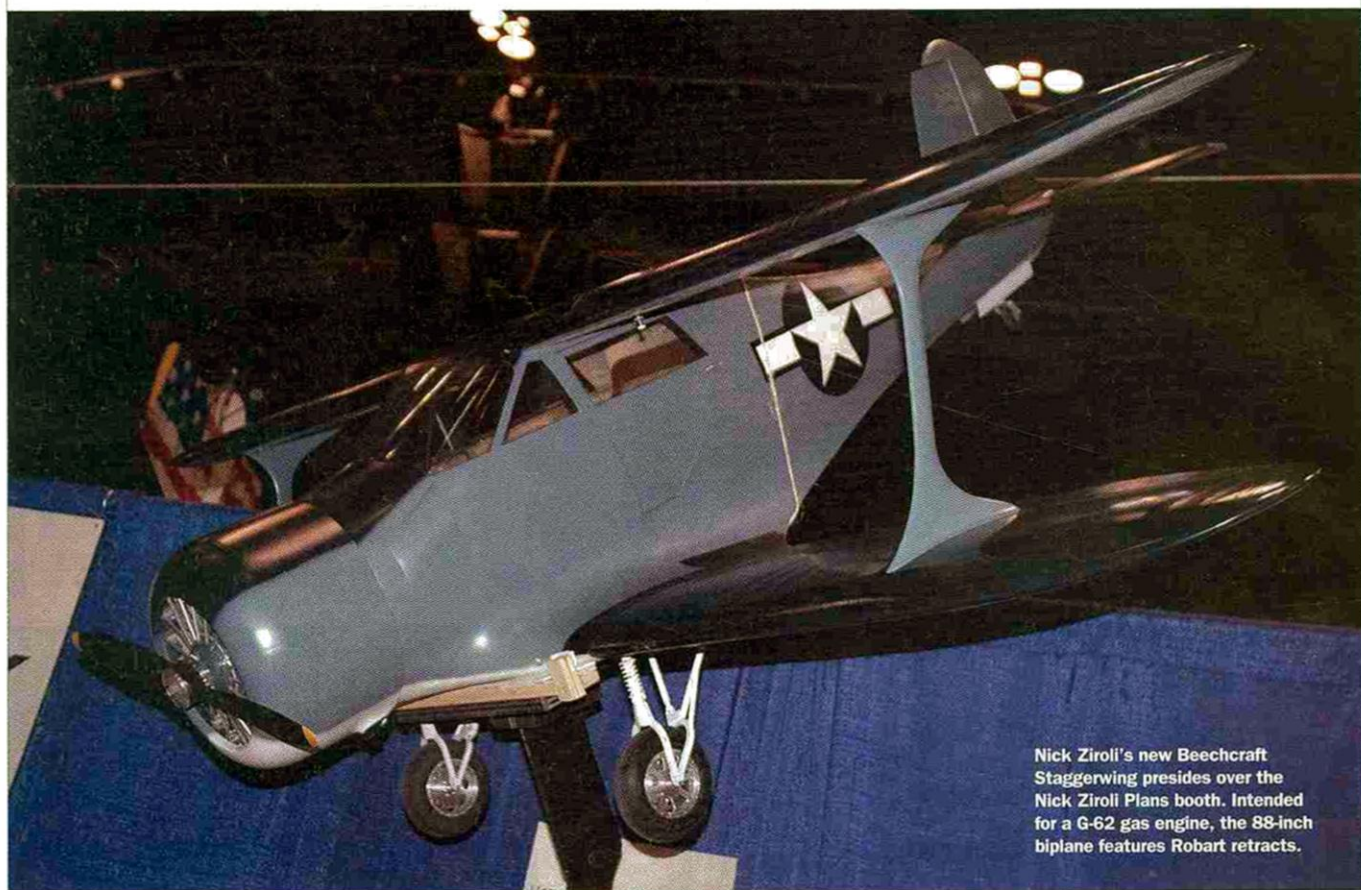
The Fuji BF34EI engine develops a great deal of torque and easily turns large-diameter props without overheating. It has excellent fuel consumption: I estimate it to be less than half that of a comparable 2-stroke gasoline engine. The electronic-ignition system and the engine's low, 4-stroke compression cycles make starting very easy. And as far as exhaust emissions go, there's hardly any oily residue. Now, who wouldn't love that?

For giant-scale airplanes that need to turn big props, the new Fuji 4-stroke engine is a perfect match. And considering all the talk from the Environmental Protection Agency about small gasoline engines having to become more earth-friendly, the new Fuji 4-stroke BF34EI seems well positioned to lead us into a quieter, cleaner and more efficient future. Fuji's new 4-stroke gas engines are definitely "green"! ✚

See the Source Guide on page 151 for manufacturers' contact information.

WHAT'S NEW FOR **GIANT SCALE**

BY GERRY YARRISH > PHOTOS BY GERRY YARRISH



Nick Zirolli's new Beechcraft Staggerwing presides over the Nick Zirolli Plans booth. Intended for a G-62 gas engine, the 88-inch biplane features Robart retracts.

ONE OF THE COUNTRY'S MOST POPULAR RC HOBBY TRADE SHOWS,

and certainly the biggest on the East Coast, is the annual Westchester Radio Aeromodelers (WRAM) Show. Held in the Westchester County Center in White Plains, NY, on the last weekend of February, the show has been presented every year since 1968. Modelers and exhibitors from all over the country attend, and it is a great showcase for the latest in kits, engines, motors, radio systems, accessories and other RC-related hardware.



The WRAM Show was crowded with eager modelers looking at all the great new products.



Winner of the Civilian category was this impressive 35-percent-scale Pitts Model-12. Built from the bigairplanes.com kit, the big biplane is powered by a DA-100.



Always smiling, Mike and Nancy Roselli have videos and scale documentation for warbird lovers.



Dave Patrick Models' new 30-percent Ultimate is a perfect choice for a giant-scale aerobatic multi-winger needing a 40 to 50cc gas engine. Also on display was the new Dave Patrick Models Blue Head 2.10 2-stroke glow engine. It puts out 5hp!

In addition to some 150 exhibits by hobby manufacturers and organizations, the show also draws modelers to its static competition. This alone is worth the price of admission, as the model competition is a collection of the best RC scale and sport models you'll see anywhere. The static-competition categories include: WW I, Post-WW I Military, Golden Age (1919 to 1939), Civilian, Stand-Off Scale, Pattern, Old-Timer (RC assist), Sport, Glider,

Helicopter, Designer Scale (for original design models; open to kit manufacturers) and Electric Scale.

In addition to handing out issues of *Model Airplane News* at Air Age Media's booth, I had an opportunity to discover some of the new giant-scale products and kits that were unveiled at this year's show; as always, there was a lot to see.

NICK ZIROLI PLANS

It just wouldn't be the WRAM Show without a quick stop to say "Hi" to the Zirolis gang! This year, Nick Zirolis Jr. showed off his dad's new Beechcraft Staggerwing complete with Robart custom-made retractable landing gear. The beautiful 1/4-scale plane is designed around a Zenoah G-62 engine, and it has an 88-inch span. The model has 2,350 square inches of wing area and should come in between 30 and 35 pounds. Nick Sr. finished the prototype in a three-tone-blue Navy scheme using Scale Stits fabric and PolyTone paint. Nick Sr. says it flies like a dream, so give Nick Jr. a call at (631) 467-4765 to check on the availability of this great new plan set.

“THE MODEL COMPETITION is a collection of the best RC scale and sport models you'll see anywhere.”

A.M.R. WARBIRO VIDEOS

Whenever I see Mike and Nancy Roselli of A.M.R. Productions at a show, I always stop to see what's new. A.M.R. offers all sorts of scale documentation and videos that are of particular interest to giant-scale warbird lovers. The videotapes and DVDs are two hours long and filled with great, on-the-flightline footage. If you've ever been interested in attending a warbird event, Mike's videos will give you a taste by showing the good, bad and the ugly; nothing is held back! The videos and DVDs sell for \$20 each (plus \$4 S&H). Contact Mike or Nancy at (609) 971-8338, or by email at warbirds@comcast.net.

DAVE PATRICK MODELS

Knowing full well that I have a big soft spot for all things with two wings, Dave Patrick made sure that I learned about his very impressive 30-percent Ultimate ARF. This giant biplane is just like all his other Ultimates—and then some! It has a span of 70.5 inches and is intended for 2ci glow engines and 40 to 50cc gas engines. The new Ultimate comes beautifully finished in UltraCote and has painted-fiberglass parts. If you have a hankering to get into some serious IMAC aerobatics, or if you just want a superduper biplane to impress the guys at the club flying field, this one will do the trick!

Dave's new Blue Head 2.10 2-stroke glow engine was also on display. Dave says this handsome devil will run beautifully on 5- to 15-percent nitro fuel, and it provides excellent power with a great idle and throttle transition. The engine has a 2.10ci displacement and is rated at 5hp plus. Recommended prop sizes are 20x10 and 22x8. The Menz Ultra 20x10 prop turning at 7,400rpm develops an impressive 25.5 pounds of static thrust!





Dick Sarpolus won third place in the Sport (non-scale) category with his turbine-powered Discovery Jet. It was featured as a construction article in the April 2005 issue.



Dave Platt won big time with his impressive Vought Kingfisher. He took first place in Designer Scale and also won Overall Best in Show with his 72-inch-span beauty!



Faye Stilley entered his self-designed, scratch-built Comet Chaser biplane at the show. He won the Best Monokote Finish award and second in the Sport (non-scale) class.

STATIC COMPETITION

When it comes to the static competition, giant-scale models always do well. Some of these beauties really made an impression with the judges, and I just can't wait to see many of them fly!

Dave Platt entered his immaculate Vought OS2U Kingfisher in the competition. This 1/6-scale Navy patrol aircraft has a 72-inch span and is powered by a Platt-built 1.20 glow engine. Completely detailed inside and out, the model is the subject of Dave's newest series of "Advanced Techniques" DVDs. It uses a unique half-shell fuselage construction strengthened with carbon fiber and finished inside and out with glass cloth. Dave earned first place in Designer Scale and Overall Best in Show for his Kingfisher.

In the Civilian class, Bob Trueworthy teamed up with builder Tom Drake for a first-place win with a 35-percent Pitts Model-12 biplane. Designed by Bob, it has a 93-inch span and is powered by a DA-100 twin-cylinder gas engine. What makes this model so interesting is that it was painted for full-size aerobatic pilot Debby Gray to see whether she would like the color scheme before it was applied to her full-size Model-12! Since the full-size aircraft is painted to match the model, I guess no one can argue whether the model's scheme is scale!

Bob also let it slip that he's working on a smaller 25- to 27-percent version of the Pitts Model-12 in the 68- to 72-inch-span range that's designed around the DA-50 engine. Now there's a model I'd like to build!

In the Sport (non-scale) category, two *Model Airplane News* contributors took home some hardware. Faye Stilley earned second with his scratch-built Comet Chaser biplane. Powered by a Webra 1.20/2-stroke engine and spanning 60.5 inches, the model was built from his own plans. The Comet Chaser also earned Faye first place in the Best Monokote Finish category. Dick Sarpolus won third with his turbine-powered Discovery Jet. Featured as a construction article in the April 2005 issue, the Discovery Jet (plan no. FSP0405A) is an IMAA-legal model with a span of 82 inches. Powered by a SimJet 1200 AES turbine, it has a simple fuselage construction and a foam-core wing. Dick says it brings turbine power to the masses!

If you've never attended a trade show, then you should consider doing so. It will open your eyes and increase your knowledge of what the hobby industry is all about. This is only a sampling of the great stuff that was on display at the 2005 WRAM Show. For more information, check out the website at WRAM.org. Until next time, think big! ✈

FREE
DOWNLOADABLE
PLAN!



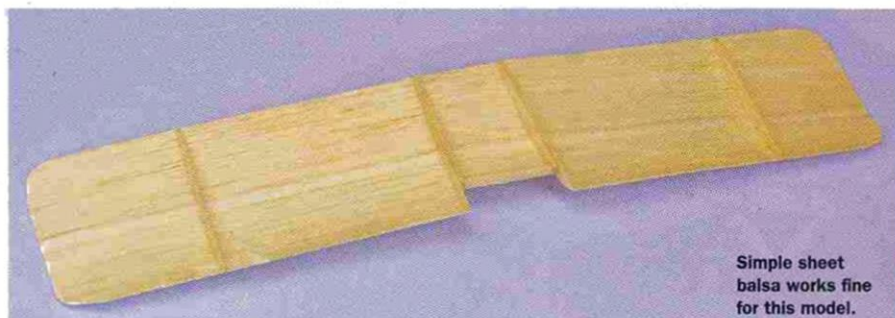
Micro Clipped-Wing Taylorcraft

Classic build for the outdoor aviator

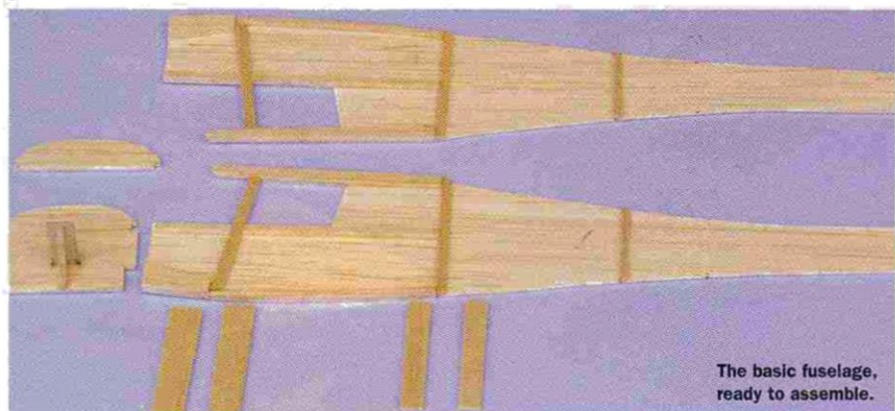


Reading glasses are a big help when you build micro models!

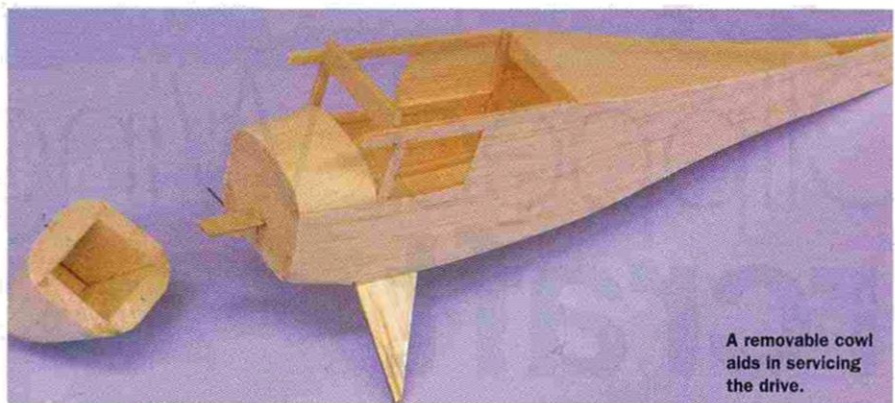
THE TAYLORCRAFT MODEL BC-12D WAS ONE of the most attractive and efficient aircraft marketed in the late 1940s. Somewhat overshadowed in the modeling community by the Piper J-3 Cub, it rarely receives the attention it deserves. In addition to the standard version, there was a clipped-wing variant, but only a few of those were built. Probably the most famous of these was the aerobatic clipped wing that was flown at numerous airshows by Duane Cole. As a spectator watching Duane's consummate skill with this modestly powered airplane, I knew that I would one day build a model of the Taylorcraft.



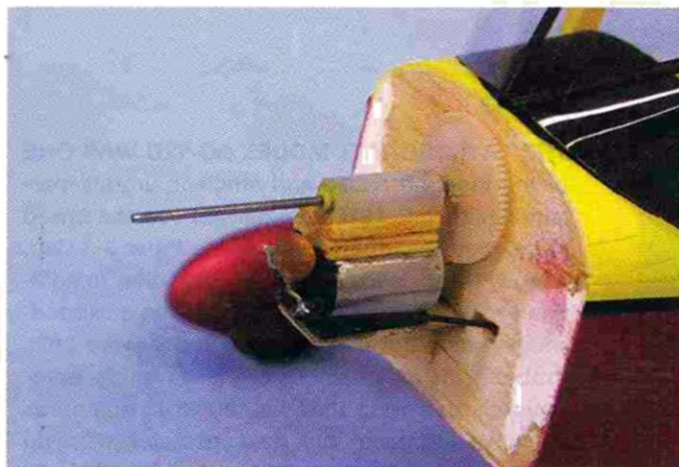
Simple sheet balsa works fine for this model.



The basic fuselage, ready to assemble.



A removable cowl aids in servicing the drive.



The drive unit is mounted backwards to provide adequate gear clearance. To correct the prop direction, I reversed the power leads.



The small size is no reason to skimp on details.

SPECIFICATIONS

WINGSPAN: 15.5 in.

LENGTH: 12 in.

WEIGHT: 30g (1.06 oz.)

WING AREA: 45 sq. in.

WING LOADING: 3.4 oz./sq. ft.

RADIO REQ'D: 3-channel w/Dynamics Unlimited RFFS-100 receiver and actuators

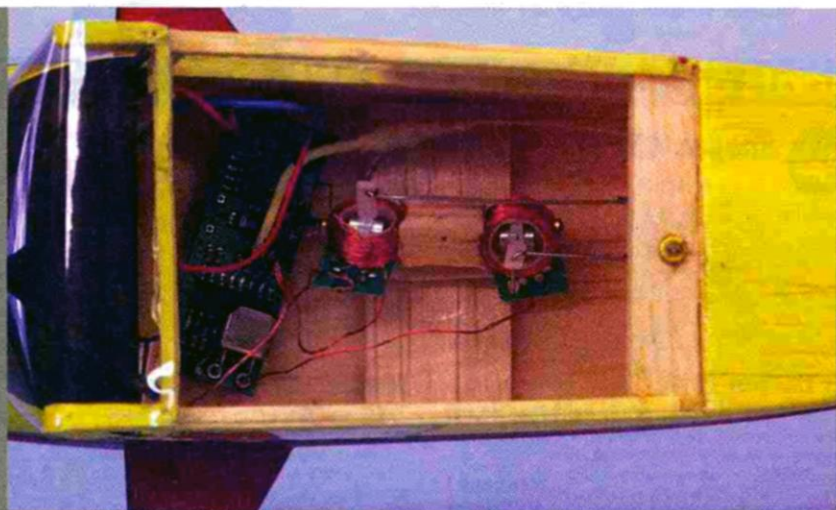
MOTOR REQ'D: Mabuchi LV M20 geared 6:1

PROPELLER: 5.2x4

BATTERY: 1-cell, 230mAh Li-poly

As I reviewed my options for a new micro-model, I decided to use an all-balsa structure. As long as the weight of the wood is kept modest, this method produces a model that is sturdy and reasonably realistic. Because I wanted to power the little Taylorcraft with a single Li-poly cell, I decided to use the LV M20 Mabuchi motor and geared it 6:1 to get the maximum thrust at the required low weight. I have had excellent results with the Dynamics Unlimited RFFS-100 control system along with its actuators. If you fly at a site where interference may be a problem, the JMP receiver is a reasonable alternative.

I decided to try a balsa primer that Scott Christensen of Sig Mfg. recommended to me: Delta Stencil Magic Top Coat Satin Spray. It comes in 4.75-ounce cans and is available in craft and paint stores. After applying three coats (sanding between the coats with 400-grit paper), the wood's surface was very smooth, and it had gained



COMMENTS

The Micro Clipped-Wing Taylorcraft is a scale model of an early American light plane. I made some minor modifications to the model to simplify the construction and enhance its flight qualities. The little Taylorcraft is an "honest" model that doesn't have any bad habits or tricky flight qualities.

practically no weight. For color, I used touchup spray paint from an auto-parts store (be sure to get the lacquer-based type). The entire finish added only about 1.5 grams to the model.

I would love to report that the model "flew right off the board," but that would be a fib. Its first flight was brief and plagued with violent Dutch rolls. In an effort to find what was causing the problem, I taped extra area onto the vertical tail. This tamed things down and made a sweet flyer of the little bird. The model in its finished form sports an enlarged vertical tail that is the permanent fix. Apparently, using a propeller so much larger than scale caused the original fin area to have stability problems. Built as per the plan, this little Taylorcraft will slow down and coast along with ease, and it turns as tightly as you like without any issues. It really is a sweet flying machine.

IN THE AIR

I set my transmitter to the 125-percent throw value to get the most torque from the actuators. The balance is important, so make sure that it matches the plan. Perform a range check with and without the motor running. I use an E Cubed R/C micro antenna with excellent results. Go over the wings and tail one last time to confirm that there are no warps, and charge the battery.

There are no special "tricks" for flying the Taylorcraft; it responds smoothly and has a brisk climb at full power. Although aerobatics are not a priority, mine will loop and perform stall turns along with snap rolls and spins. My only advice is that you fly two mistakes high while you are becoming familiar with your new model. ✈

See the Source Guide on page 151 for manufacturers' contact information.



FOR PLAN & BUILDING INFO

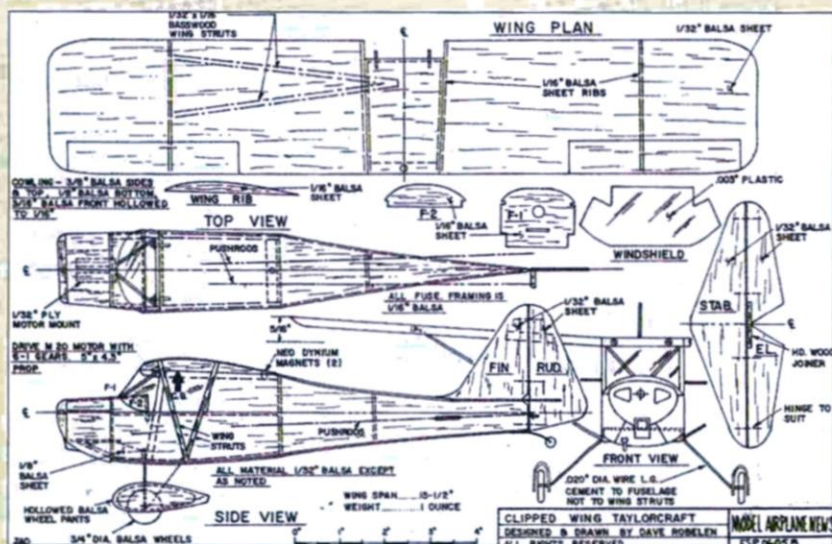
MAGNETIC ACTUATOR CONTROL

THE MAGNETIC ACTUATORS CURRENTLY AVAILABLE ARE MARVELS OF SIMPLICITY.

Consisting of a wire coil and a strong rare-earth magnet (along with plastic hardware), these devices typically weigh no more than 1 gram, yet they have adequate force to move the control surfaces of a 1-ounce model through full deflection at maximum airspeed.

The principle of their operation is based on using a receiver that's designed to drive these devices. These micro-receivers have circuits called drivers that convert the servo-type signal into a smooth, proportional voltage that matches the transmitter-stick position. The result is a device that moves as smoothly as a servo without any wiggling or flutter. The magnet pivots in the center of the coil, and it rotates proportionally to the voltage in the coil. Typically, an output arm is fastened to the magnet that's connected to the control surface. There are several ways to give these magnets a center reference. A tiny rare-earth magnet may be fastened to the coil of an individual actuator, or two of the actuators may be mounted in proximity to each other for mutual centering.

MICRO CLIPPED-WING TAYLORCRAFT FSP0605B



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Paint a Pilot Figure

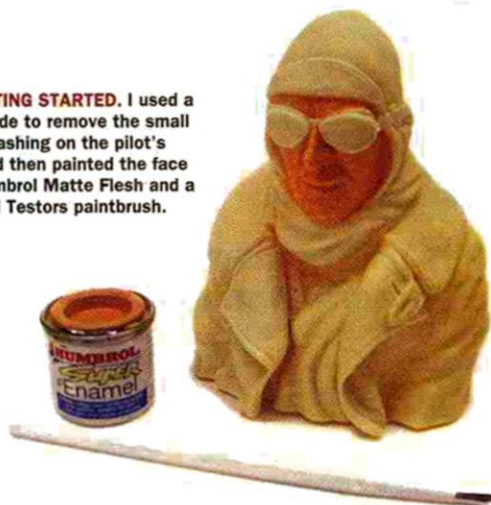
MAKE A FANTASTIC FLYBOY IN 6 EASY STEPS > BY TOM POLAPINK > PHOTOS BY TOM POLAPINK



WHO WOULD GUESS that the little pilot in a model cockpit could inspire so much terror and trepidation? Painting a pilot figure that's worthy of sitting in your beautifully detailed plane isn't as difficult as you might think. Fortunately, if you start with a high-quality figure and you have a steady hand, even a simple paint job will produce a pilot that looks realistic. I used Aces of Iron's 1/5-scale "Mike" figure because he'd look perfect in a WW I model. Here are six simple steps I used to get Mike into the cockpit of my Albatros.

1

>> GETTING STARTED. I used a razor blade to remove the small bits of flashing on the pilot's back and then painted the face with Humbrol Matte Flesh and a standard Testors paintbrush.



2

THE JACKET. I also used a small Testors paintbrush to paint the jacket and helmet with Humbrol Matte Black.



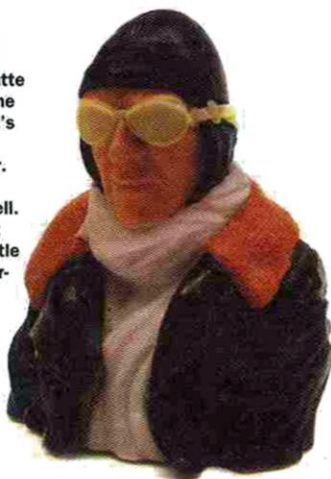
4

THE GOGGLE STRAP. I shaved one end of a small scrap of 1/16-inch-thick hard balsa razor thin and used it to apply Testors Brown paint to the goggle strap. From this point on, I used "balsa brushes," made of scrap balsa with custom-shaped tips to suit the parts being painted. The balsa soaks up the paint but doesn't have bristles that tend to splay and paint parts that you didn't intend to paint. Humbrol Matte Black is perfect for the goggle pads behind the metal frames.



3

THE SCARF AND COLLAR. Humbrol Matte White is perfect for the scarf around the pilot's neck. I used Testors Flat Tan for the collar. Humbrol and Testors paint work equally well. I painted Mike's shirt with Testors Flat Battle Gray. Only a small portion of it is visible.



5

THE GOGGLES. The first step is to paint the flesh-colored area of the goggles. I used a balsa brush to apply Humbrol Matte Flesh; then I added a semitransparent green tint, Testors Flat OD, over the flesh color. To best accomplish this, don't shake or stir the bottle of paint; use balsa brushes to apply the pigment and the thinner separately. You have to work quickly to get an even, semitransparent coat over the flesh color because the paint tends to dry quickly. Use a small, soft paintbrush to evenly spread the paint. On a piece of plastic, mix a splash of black paint into the green you used on the lenses. Paint around the inside edge of the goggle frames, and blend this darker green into the semitransparent coat using a thin balsa brush or soft paintbrush. I mixed Testors Silver paint with a dash of black and applied it with a piece of balsa the size of a toothpick.



6

TOUCHUP. Use small, custom-shaped balsa brushes to retouch parts. When you're satisfied with your paint job, coat the entire figure with Testors Dull Cote. It dramatically smooths everything, and it dries fairly quickly. Now you can liven up the lenses with a thin coat of 5-minute epoxy. Coat one lens at a time, and prop the pilot up so that the epoxy will dry level. This helps create the illusion of glass.

Now go fly! Your friends at the field will definitely notice your great-looking pilot figure in the cockpit. ✈

See the Source Guide on page 151 for manufacturers' contact information.



The engine that wouldn't quit— and other questions

BY DAVE GIERKE



The arrow indicates a machined groove running behind the front crankshaft ball bearing to the air-induction hole in the crankcase. This is often the source of an air leak if the crankshaft-to-crankcase seal is dry.

THE LITTLE ENGINE THAT WOULDN'T DIE

Brad Delovese emails, "I have a Magnum .40 engine (a 2-stroke) that refuses to quit running when I close the throttle. It simply sits there and idles very slowly. I have to stop it by throwing a rag into the propeller! Since the throttle barrel is closed tightly, where is the engine getting the air to continue running? I've checked the carburetor-to-crankcase seal by squirting a bit of fuel around the interface and looking for air bubbles, but there aren't any."

Brad, you aren't the first to observe this phenomenon! Many modelers would like to have your problem, however. Most idle-related letters that I receive ask how to obtain and maintain a lower idle. There are several locations where air can bleed into the engine's crankcase, including:

- Secondary needle valve
- Primary needle valve
- Carburetor attachment to crankcase
- Throttle barrel/throttle-barrel housing interface
- Backplate
- Crankshaft seal and fuel-return passageway

Most of these potential air-leak sources can be detected using your method: apply a bit of fuel or low-viscosity oil to the various interfaces while the engine is idling, and watch for bubbles.

A source of air infiltration that is seldom considered is the fuel-return passageway in the front crankcase housing. This tiny passageway commutes from behind the front crankshaft-support ball bearing to the air-induction hole below the carburetor's neck and immediately above the crankshaft. Easily overlooked, the passageway can be a drilled hole or a machined groove. Fuel that has

OUR READERS CONTINUE TO SUBMIT QUESTIONS

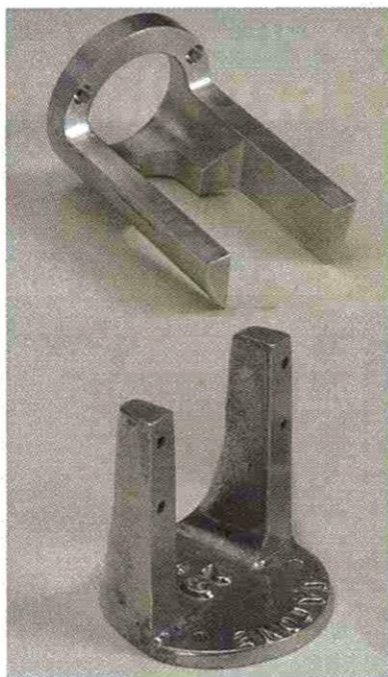
concerning all phases of miniature-engine technology. This month's topics for discussion are engines that won't stop running, engine mounts, setting the needle valve before startup and nitro content of fuel for 1/2A engines.

leaked past the shaft-crankcase seal is "sucked" back into the engine before it exits behind the drive washer, eliminating the possibility of an engine compartment mess. The system works well, provided there is a shaft-seal fuel leak in the first place! If the seal doesn't leak, the fuel-return passageway can bleed a bit of air back into the engine. This may be what's happening with your engine.

If this engine belonged to me, I'd enjoy the idle "problem"! Bet your friends that your engine will idle longer than theirs—or any other engine on the field—and have a little fun! When your engine wears a bit, the annoying idling situation will become a thing of the past. By the way, throwing a rag into the propeller is potentially an unsafe practice. In future, try pinching the fuel line!

ENGINE CONNECTION

Mr. B. Samuelson emails, "Modelers spend hundreds of dollars on an engine and then mount it on a cheap, glass-filled mount. I've always thought that the bottom of the engine lugs should be machined flat and parallel to each other, so they can be screwed down to a sturdy, one-piece aluminum firewall mount. Will you please comment on this?"



This is a top-quality, bar-stock aluminum-alloy radial-engine mount for a .40ci engine. Considered the absolute best in providing maximum engine torque and power to the propeller, this type of mount also costs the most to produce.

This cast-aluminum radial-engine mount has had its surfaces machined flat and square by the manufacturer.

Mr. Samuelson, my longtime friend Luke Roy—holder of many AMA national control-line speed records—insists that rpm and horsepower gains reside in the engine-mount interface. The problem, as you suggested, is composed of two parts:

▶ **Bottom of the engine-mounting lugs.** These must be machined flat and parallel to one another to prevent the crankcase from becoming distorted when the engine is screwed down to an acceptable engine mount. Crankcase distortion causes the engine parts to become misaligned, thereby increasing wear, reducing performance and shortening engine life. The good news is that, unlike common engine-manufacturing practices of the '50s and '60s, modern CNC (computer numerical control) production includes this important lug-squaring step.

▶ **Engine mounts.** Old-timers will tell you that there is no substitute for a sturdy aluminum engine mount that has been carefully machined to the same flat and parallel specifications as the engine lugs. These mounts are one-piece affairs that can be securely fastened to the model's firewall or shock-mounted (e.g., with rubber grommets) to reduce engine noise.

To reiterate, the interface between engine and mount must not produce crankcase distortion. Two-piece aluminum mounts, glass-filled plastic mounts and wooden mounting beams are all considered inferior to the one-piece aluminum mounts. This brings to mind the time I used my strobe (an adjustable, rapidly flashing light) to watch a pylon-racing .40 perform on my test stand that was equipped with my first (and last) fiberglass-filled plastic mount. I was shocked to observe the engine "walking around," as disclosed by the stop-action effect of the synchronized flashing light. Of course, this technology doesn't come cheap: whether they're cast or bar stock, aluminum mounts cost considerably more than inferior types.

GLOW-PLUG BURNOUT

Jim Shannon writes, "I have a one-year-old O.S. LA .40 with more than 100 flights. The only trouble that I have experienced is with glow-plug burnout—at least one for each flying session. Although

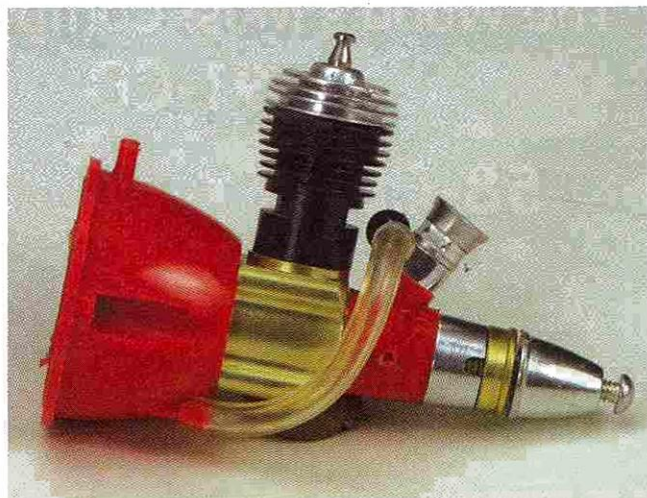


The backplate of this McCoy glow engine shows the distinctive wear pattern of a rubbing crankpin (arrowed). Aluminum particles combine with the platinum alloy of the glow-plug element to lower the melting point and cause premature burnout. The brownish-black color of the lubricating oil exiting the exhaust signals that something inside the engine needs immediate attention.

the engine runs well, I've noticed that the waste oil on the wing and tail looks black. I use 5-percent nitro fuel with 18-percent synthetic oil, an APC 11x6 prop and O.S. no. 3 plugs. Could the engine be wearing out already?"

Jim, I believe that your glow-plug-burnout problem and the black oil are related. Do you use an electric starter? When the crankshaft is pushed to the rear of the engine during startup, the end of the crankpin and/or connecting rod may rub against the front face of the backplate. This often results in the crankpin's cutting a groove in the backplate. Aluminum particles passing through the engine can chemically combine with the platinum-alloy electrode wire and lower the melting-point temperature, causing the glow plug to burn out. The blackish-looking oil is actually aluminum particles in suspension. My friend Clarence Lee suggests that you rub a drop or two of this contaminated oil between your thumb and forefinger while holding them up to the sunlight. If these particles glint in the light, you've confirmed their existence.

Here's a way to make sure that the crankpin isn't rubbing against the backplate: with a propeller in place, push the crankshaft back while rocking the prop back and forth. You shouldn't feel any resistance or binding; the engine should feel the same as it does when the crank is pulled forward while you rock the propeller. If anything binds, there's a simple solution: add a second backplate gasket to ensure the necessary clearance.



This Cox .010ci glow-ignition engine has a generous cooling-fin area. The ratio of its cylinder and cylinder-head cooling fins to its displacement is very high—higher than that of most .049ci engines. Unless the fuel blend contains high percentages of nitromethane (30 to 35 percent), the engine will experience incomplete combustion and will run rough.

SOME LIKE IT HOT

An email from Ned Turner asks, "One thing puzzles me about the operation of 1/2A engines: why won't they run on low nitro percentages like my larger engines?"

Ned, this is a question that comes up from time to time. The problem with all 1/2A engines is that they're overcooled. The reason for the 1/2A's overcooling problem becomes apparent when you

measure the area of its cylinder and cylinder head and compare it with its cylinder displacement. Check out the ratio of area to displacement for a variety of engine sizes:

Displacement (ci)	Ratio of area to displacement
0.049	13:1
0.40	6:1
1.2	4:1

The fact is, most 1/2A engines don't need cooling fins. Since engine manufacturers choose to include them, however, increasing the nitromethane content of the fuel blend (between 25 and 35 percent) is a convenient way to avoid the effects of overcooling: rough operation and poor combustion. Nitromethane adds heat and power to the operating cycle of any engine, as long as other operating parameters, such as compression ratio, are also adjusted to prevent detonation (that frying-egg sound). Adding nitro also increases the temperature of the crankcase, causing atomized fuel particles to vaporize before they're transferred into the combustion zone. Vaporized fuel does a much better job of mixing with air and burning than do liquid droplets in an overcooled engine. Also, 1/2A engines start more easily when small quantities (2 to 3 percent) of an igniter such as propylene oxide are added to the fuel.

TIME TO START

An email from Sam Jablonski states, "I recently purchased a new .40 2-cycle engine and have a question concerning the needle-valve setting prior to startup. Should the needle valve be left alone once the best mixture has been found for running at high speed? Can I start at this setting? Should the engine be started at idle, at full throttle, or somewhere in between?"

Sam, the needle valve should be opened slightly (richened) before each new flying session. From there, you can adjust it for peak rpm at wide-open throttle before backing off rich by 200 to 300rpm. Opening the needle before the initial start is necessary to compensate for any atmospheric changes that could leave your previous setting lean. You may start your engine at idle, part throttle, or wide open; it's a matter of individual preference. Most enthusiasts prefer to start their engines at partial throttle because it's safer and results in fewer kickbacks. ✈

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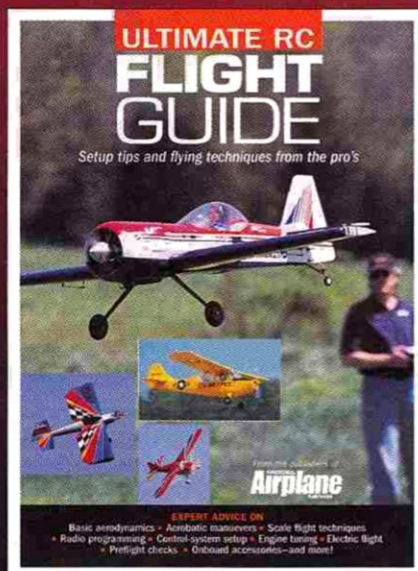
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Hal strikes a familiar pose with one of his replica free-flight (RC-assisted) models: the Airfoller.

“ALWAYS AN INNOVATOR, Hal developed numerous modeling devices that are still in use today ...”

Harold “Pappy” deBolt

DECEMBER 22, 1918 – FEBRUARY 10, 2005

TO THOSE FAMILIAR with model aviation, Hal “Pappy” deBolt was one of the most influential pioneers in the industry. A model designer, competitor, manufacturer and author, Pappy’s love affair with modeling began in 1927. He spent his early modeling career competing in everything from rubber-power and free-flight to U-control and then progressed to all aspects of RC. For years, Pappy flew in pattern and pylon-racing events, and he was a member of the FAI World RC Team from 1960 through 1973.

Always an innovator, Hal developed numerous modeling devices that are still in use today, including a wing spoiler dethermalizer for free-flight (1938), retractable landing gear for control-line speed models (1943), pressurized fuel systems for control-line speed models (1947), aluminum landing gear for control-line and RC models (1948) and the clunk-type RC fuel tank (1952)—to name just a few.

For his many contributions, Pappy was honored by the Academy of Model Aeronautics (AMA). The history of RC is replete with examples of his service, and in 1959, Dr. Walt Good nominated him as an AMA Fellow and lifetime member. His formal AMA service included a stint as vice president from 1956 to 1959.

As a writer and magazine contributor, Hal enjoyed sharing his thoughts and observations

with the modeling community. His first article, “Experiments in Speed Design,” appeared in *Air Trails* in 1948. His first *Model Airplane News* feature article, “Speed Can Be Fun,” appeared in May 1951. Pappy’s association with *Model Airplane News* was long and noteworthy, and he became a regular contributor in February 1985 with his “Downwind Leg” column, in which he wrote about everything from model aerodynamics to the promising future of electric-powered models. Then, in February 1986, he wrote a feature entitled “The Golden Age of RC” that introduced aeromodeling’s rich history to a brand-new generation of readers. In May of that year, this popular topic became a regular column. Pappy penned “Golden Age of RC” until June 1998, becoming one of the magazine’s most beloved contributors.

His collection of model designs is truly impressive, and he is most well known for his “Live Wire” series of airplanes. His deBolt Model Engineering Co. (Dmeco) produced countless single- and multi-channel model kits, including his favorite: the 1950s-era “Live Wire Champion” that he produced for an impressive 30 years.

We at *Model Airplane News* are deeply saddened by the loss of someone who was not only an icon within the modeling hobby but a cherished friend as well. †



Here, Hal shows off his impressive Viscount. Powered by a SuperTigre .46, this low-wing design was Hal’s Nats bird in the early 1960s.



From his September '87 column: Hal discusses the first FAI RC World Championships. Left to right: Jerry Nelson, Walt Schroder, Hal (with ever-present pipe) and teammates Ed Kazmirski and Bob Dunham.